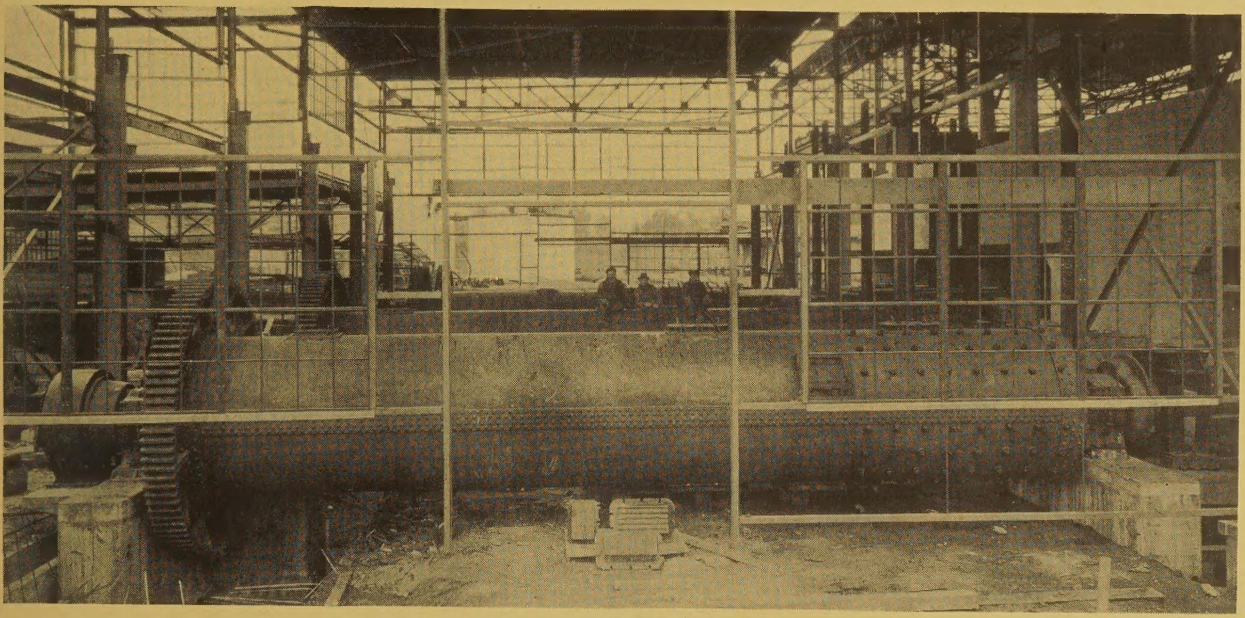
MILL SECTION of
Concrete

THE UNIDAN MILL

(Trademark Registered)



The Modern
THREE-STAGE GRINDER

This machine combines granulating and pulverizing in one unit. It has three grinding compartments and one screening compartment. The screen is internal and is located between the first and second compartments. Manholes in the shell permit easy and quick replacement. The tailings are returned to the first compartment for regrinding, a uniform product only being delivered to the second chamber. The final pulverizing is done in the third compartment.

Changing the size of screen and adapting the size of grinding bodies in each compartment to the grinding work required give great flexibility in the grinding operation.

The Unidan mill is highly efficient on either wet or dry materials.

F. L. Smidth & Co.

(Incorporated 1895)
ENGINEERS
Designers and Equippers of
Cement Making Factories
Factory, Foundry and Laboratory—Elizabeth, N. J.

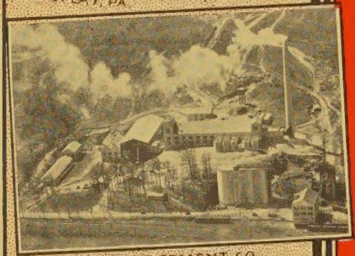
225 Broadway **NEW YORK**

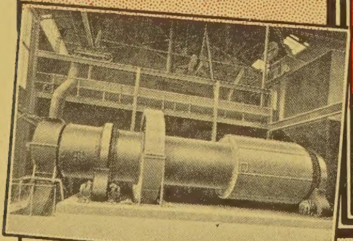
Index to Advertisers on Page 99 of This Section

POLYSIUS

HOLDERBANK PORTLAND CEMENT CO. SWITZERLAND

COPLAY CEMENT CO. COPLAY, PA.


VALLEY FORGE CEMENT CO. CONSHOHOCKEN, PA.


ABERTHAW & RHOOSE PORTLAND CEMENT & LIME CO., LTD. CARDIFF, ENGLAND.

POLYSIUS EQUIPMENT
IN USE IN
CEMENT PLANTS
THROUGHOUT THE WORLD

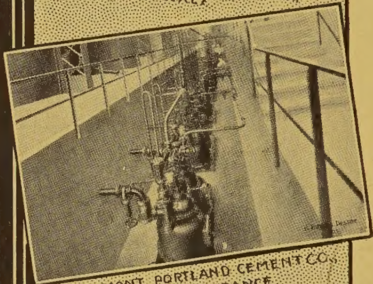
The supremacy and recognized leadership of Polysius Equipment is reflected in the installations in these plants scattered over the four corners of the globe.

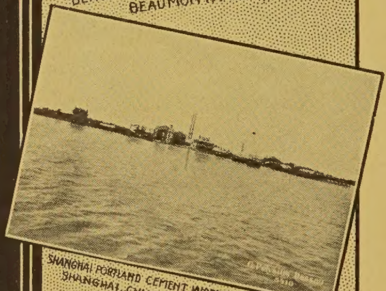
The well known firms of Cramp Morris Industrials, Inc., Philadelphia and the Coatesville Boiler Works, Coatesville, Pa., collaborate in the building of Polysius Equipment.

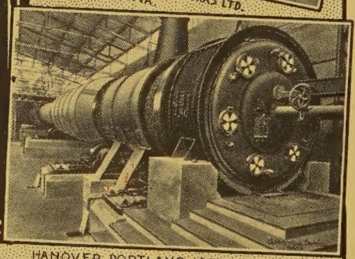
Polysius Equipment in the New Plant of The Keystone Portland Cement Co., Bath, Penna. . . . .

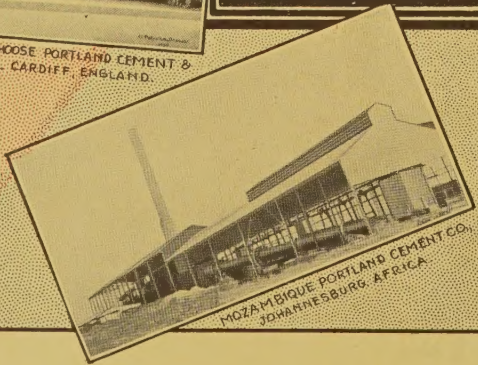
Polysius Corporation
Bethlehem, Pa., U. S. A.

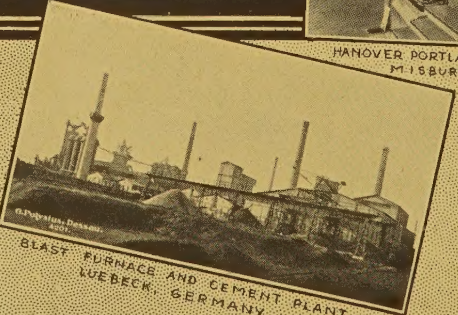
ADRIATIC PORTLAND CEMENT CO. SALERNO, ITALY


BEAUMONT PORTLAND CEMENT CO. BEAUMONT, FRANCE


SHANGHAI PORTLAND CEMENT WORKS LTD. SHANGHAI, CHINA.


HANOVER PORTLAND CEMENT CO., MISBURG, GERMANY.


MOZAMBIQUE PORTLAND CEMENT CO. JOHANNESBURG, AFRICA


BLAST FURNACE AND CEMENT PLANT LUEBECK, GERMANY.

MILL SECTION of Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 34 February, 1929 Number 2

CONTENTS

Kiln Problems 101

In this unusually complete analysis of kiln design and operation, Mr. Zollikofer, a German cement plant engineer, discusses his experiences in kiln research in American plants.

Monolith Portland Midwest Co. Builds New Plant at Laramie —*(Illus.)* 105

The concluding installment of a complete description of this modern plant which has just gone into production.

Editorial 109

Transporting Cement
A Step Toward a Standard

Grinding Raw Materials and Clinker in the Modern Cement Plant—*(Illus.)* 111

Mr. Catlin discusses present-day grinding practice in this article, presenting his reasons for favoring two-stage grinding.

Cement Consumption Increased in 1928 115

A review of conditions in the cement industry, reprinted from "The Economist."

Men and Mills—*(Illus.)* 118

Cement Statistics for December—*(Illus.)* 120

Mill Equipment—*(Illus.)* 121

With the Manufacturers 122

In the Construction Section

~

Structural Concrete in 1928 13

A Helpful Advertising Campaign 15

An editorial.

Use of High Early Strength Cement in Highway Work 27

Duff Abrams' paper presented at the American Road Builders Association convention.

Are You Going to Detroit? 30

The complete program of the A. C. I. convention.

Commercial Central Mixing Plants for the Manufacture and Sale of Ready-Mixed Concrete 37

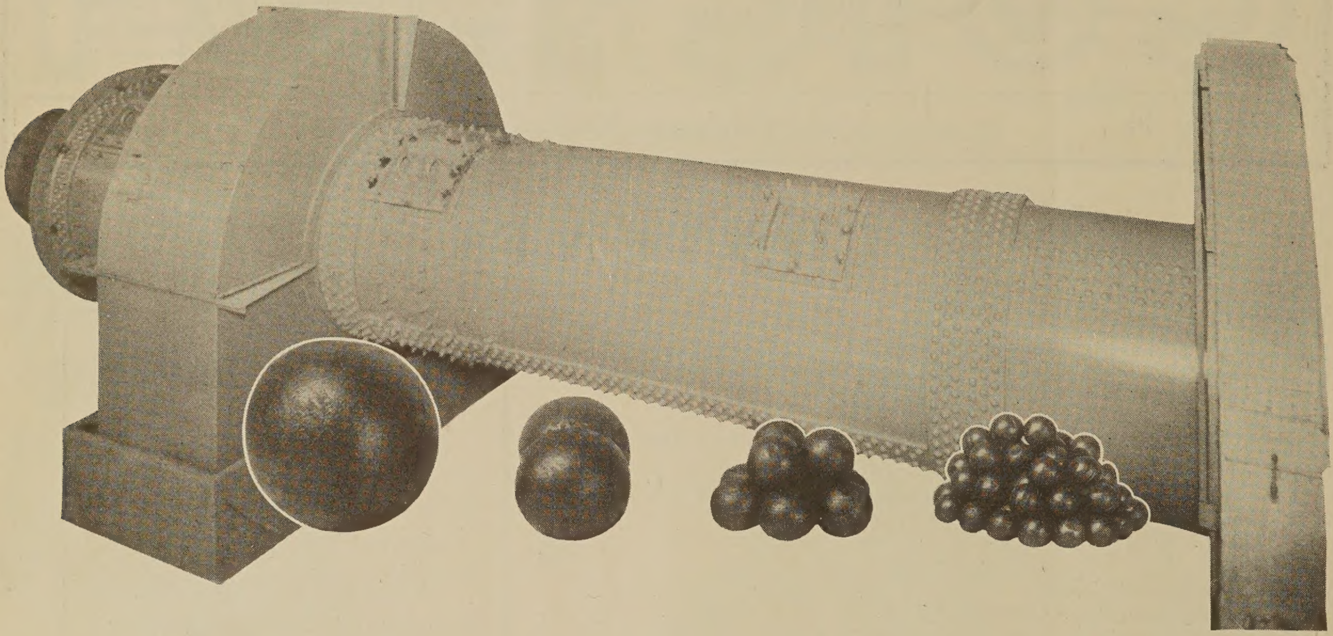
—and other articles regarding the uses of cement.

Copyright, 1929, by Concrete Publishing Co.

INDEX TO ADVERTISEMENTS

Allis-Chalmers Mfg. Co. 135
Babcock & Wilcox Co. 133
Bradley Pulverizer Co. 136
Burrell Engineering & Const. Co. 134
Coates Steel Products Co. 100
Combustion Engineering Corp. 123
Edge Moor Iron Co. 128
Engineering & Designing 94
Foster Wheeler Corp. 134
Fuller Co., The 131
Fuller Lehigh Co. 129
Haynes Stellite Co. 126
Hunt, Robert W., Co. 94
Huron Industries, Inc. 130
Jones Foundry & Machine Co., W. A. 124
Kritzer Co., The 94
Link-Belt Co. 127-138
Manhattan Rubber Mfg. Co., The 125
Meade, Richard K., & Co. 94
Pennsylvania Crusher Co. 137
Polysius Corp. 98
Quigley Furnace Specialties Co., Inc. 137
Schaffer Poidometer Co. 136
Smidth, F. L. Co. 97
Standard Oil Co. (Indiana) 132
Super Cement Co., The 96
Timken Roller Bearing Co., The Front Cover

COATES GRINDING MEDIA



meet every requirement with unexcelled efficiency

Specialization on our part has resulted in a line of uncommonly durable types of grinding bodies for use under many different conditions.

The peculiar requirements of the cement industry have had our special attention, with the result that we now have to offer what we believe to be the best selection of grinding media for this particular service that is available anywhere. Some of our grinding bodies are very low in price, and some comparatively high; but service considered, every slug or ball we have to offer is economical for the purpose it is intended to serve.

Our line includes all sizes of grinding balls and slugs as follows:

CARBEX FORGED STEEL BALLS —⅞-in., 1-in., 1¼-in., 1½-in., 2½-in., 3-in., 3½-in., 4-in., 5-in. diameter.

"TUNGSCO" Steel Nuggets—⅝x1 in., ¾x1¼ in., ⅞x1¼ in., 1x1¼ in., 1⅛x 1¼ in., 1¼x1⅜ in.

If you will let us know what your grinding requirements are, we shall be glad to submit prices on same. We carry ample stocks and can make prompt shipments.

Coates Steel Products Company

GREENVILLE, ILLINOIS

Largest Manufacturer of Grinding Media Exclusively

MILL SECTION of

Concrete

Vol. 34 Chicago, February, 1929 No. 2

Kiln Problems

Some Factors Determining the Heat Balance in Rotary Kilns—Kiln Linings—Comparison of Methods of Firing Rotary Kilns with Other Pulverized Coal Firing—Is an Increase in the Temperature of the Flame Desirable?—Maximum Burning Capacity and Economy—Comparison of Long and Short Kilns—Formula for Maximum Kiln Efficiency—Heat Transfer at the Upper End of the Kiln—Kiln Design

By W. ZOLLIKOFER

FROM the viewpoint of the kiln engineer, the burning zone of the rotary kiln is a furnace, wherein—as in any combustion process—a certain heat balance must be maintained. The heat carriers are the fuel, which supplies the heat, and the clinker produced in the burning zone, which consumes the heat. Heat losses through radiation from the kiln walls represent a factor beyond the control of the kiln operator. The temperature of the inside wall surfaces is a function of the heat balance and depends on the above values, whose relative proportions determine the process.

The kiln engineer is justified in considering the kiln as a machine operating within definite limits. The upper limit is a dangerous overheating of the kiln lining. The kiln engineer argues that the more heat is developed in the burning zone, the greater should be the charge. The lower limit in the equilibrium of the burning process emphasizes the active part played by the inner wall surfaces in preheating the pulverized coal. It is contended that, if the cooling effect prevails, the lining cannot supply the heat of radiation necessary to preheat the coal and to start the evolution of gas.

The leading consideration in cement calcination, i. e., in the production of a good clinker under the conditions described above, is the maintenance of a definite inside temperature, as overheating or excessive cooling in the burning zone naturally leads to an undesirable constitution of the clinker.

The cooling of the kiln walls by the outside air, mentioned above as a cooling factor in the burning process, is in part responsible for the formation of a coating, when no chemical agencies of accelerating or retarding effect are at work.

This coating is a crust of sintering material produced by outside cooling. For this reason attempts to place insulating material between the lining and the shell have been unsuccessful, as the coating melted away and was followed by the melting of the refractories themselves. However, an insulating layer of Silocel brick, extensively used in America, when placed near the upper end of the kiln, has given good, though inconsistent, results. The stronger the outside cooling effect, the deeper becomes the zone of crust or ring formation, i. e., the thicker the coating. When brick of excessive thickness are used in the sintering zone, it happens that the temperature level of possible crust formation lies inside the brick lining and no coating is formed until enough of the latter is worn or fused away.

Comparison of Methods of Firing Rotary Cement Kilns with Other Pulverized Coal Firing

The suitability of the pulverized coal flame, whose properties conform so well to all requirements of portland cement calcination, made the use of the simplest burner devices possible. These burners have changed little from the days when the rotary kiln was in its infancy. The necessary preheating and expelling of volatile matter of the pulverized coal is effected through the heat given off by the walls in the sintering zone. The same effect is accomplished by the clinker leaving the sintering zone in a red hot condition.

Different from the above are such pulverized coal installations as dryers, where a low temperature is maintained during the contact with the working material. Special end chambers are necessary here to permit the fuel to burn completely before the products of combustion are admitted to the material.

A comparison of rotary kiln firing with the methods used in up-to-date boiler installations shows that the rotary kiln is less efficient insofar as temperature is concerned. The question whether a temperature increase in the sintering zone is desirable and how far it should be carried, will be discussed in a further paragraph. In introducing pulverized coal firing in boiler design, an effort was made to utilize all possibilities presented by the pulverized coal flame. Aside from the other advantages offered by the new fuel, it was expected that high temperatures could be produced with the greatest possible reduction in the time required for burning, because the acceleration of the burning process is one of the conditions approaching theoretical combustion temperatures. The great width selected for the combustion chamber under steam boilers insures a slow movement of the flame gases. It is this consideration, together with the care given to the mixing of the fuel with the secondary air supply, that brought about more rapid combustion and higher combustion temperatures.

To prevent unsatisfactory mixing of the air with the pulverized coal, which would result in a slow evolution of the gases, a number of special burner devices are in use and operating with success.

Special burner devices are not used in rotary kilns, because the narrow space of the combustion chamber seems to warrant a sufficient, though not rapid, mixing of the air with the fuel. Coghlan and Arnold (CONCRETE, p. 109, May, 1927) lay especial emphasis on this point.

In the combustion chamber of the rotary kiln with gas velocities of up to 10 m. per sec. (30 ft. per sec.) the extension of the burning process prevents the reaching of temperatures above 1800 deg. C. (3300 deg. F.), yet such temperatures are reached in boilers fired with pulverized coal under the same conditions of preheating the air.

Effect of Gas Velocity

The important part played by the gas velocity in dealing with a pulverized coal flame and its temperature, is inherent in the nature of the fuel and can be recognized when a comparison is made with a pure gas flame. The time required for the combustion of a gas depends upon the thoroughness and the rate of mixing with the air supply. The temperature of the combustion chamber may accelerate the final velocity, yet this influence is not as pronounced as in the case of a pulverized coal flame, where no flame can develop without receiving a certain part of the end heat from the walls.

The pulverized coal used by cement mills is not a mass of particles of uniform size and the final combustion of the admitted cloud of pulverized coal dust does not take place uniformly. The combustion of the coarser particles requires a longer period of time.

Professor Nusselt (Zeitschr. d. Ver. Deutsch, Ing., p. 124, 1924) made a study of the relation of complete combustion and time of combustion to the sizes of particles. The computations showed that the time of complete combustion was directly proportional to the size of particle, while the time of combustion increased as the square of the size of particle. Nusselt was also able to establish by means of elaborate computations that part of the end heat which pulverized coal receives from the walls. Although he obtained a value which seemed small compared to the part supplied by the flame itself—as is entirely the case with gas firing—nevertheless, the effect of the heat of radiation given off by the walls on the completion of the combustion of pulverized coal is an important factor in the combustion process.

An extension of the combustion process produces cooling of the flame by air molecules, which act only upon the tip of the flame. The unavoidable heat losses through radiation and the heat given off by the gases for the production of the clinker over which they pass, make an increase in the temperature of the flame impossible toward the end of its passage. This could take place and the length of passage would be without influence only when, disregarding the heat absorbed by the charge, the gases were made to pass through a perfect insulating material which would catch their radiated heat and return it to them without loss. It is frequently not understood that absorption of radiated heat, whether it is a loss or is absorbed usefully, is always identical with the drop in the temperature of the flame.

The greater the length traversed by the flame, the more marked is the disadvantage of the cooling effect on the combustion process. On passing a certain maximum fuel charge, i. e., a maximum velocity of the gases, the increased length produces such a cooling effect that the walls are no longer able to give off the heat required for the completion of the process. Unburned or incompletely burned particles of fuel begin to appear—the coarser ones first.

The conditions limiting the maximum possible charge of fuel in the rotary kiln will be discussed later. As the study of the limits generally leads to a better understanding of the laws governing the processes, the writer has allotted to them considerable space below, although a study of this kind is frequently of little practical significance.

To What Extent Is an Increase in the Temperature of the Flame Desirable?

In comparing the pulverized coal firing of the rotary kiln with that of steam boilers, the shape of the combustion chamber claims first consideration. Because it was possible to extend the combustion chamber, higher temperatures have resulted and greater heat economy has been attained.

The same trend is noticeable in dealing with rotary kilns, where higher temperatures and greater heat economy are the aim. However, it is not possible in this case to extend the combustion chamber, as in it take place simultaneously the production and the conveying of the product. There remained only one method—commonly used in the design of steam boilers—namely, preheating and regulating of the air supply, a further step being the use of the clinker heat for preheating the air.

The successful results achieved thus far made a further increase of the flame gas temperature appear desirable. However, these same results frequently call one's attention to the limits, which rule out too great an increase. Should oxygen, whose use instead of air has been advocated for combustion, become an economical fuel, the rotary kiln in its present form of a combination calcining and conveying drum will be relegated to the past.

The clinkering, which takes place in the rotary kiln of today, must take place over a certain distance. Aside from the favorable effect of slow sintering on the constitution of the clinker, claimed by authorities, mechanical considerations must be taken as of equal importance. The irregular movement of the material in the sintering zone due to the ragged condition of the coating causes certain parts to travel more rapidly than the rest and traverse the sintering zone in too short a time. The movement of the material is influenced even to a greater extent by irregular feeding.

These conditions illustrate the practical limits, which become apparent when a rise in the gas temperature results in more economic fuel consumption only if the material charge is reduced. We are faced with the fact—upsetting all heat calculations—that the same quantity of heat at a higher temperature (and, therefore, theoretically better heat conditions throughout the length of the kiln) is not sufficient for the amount of material which is piled in the sintering zone, whose longitudinal dimension proves too short.

The laws of heat transfer are not misleading us; for the shortening of the sintering zone is a proof of the more rapid transfer of the heat required for the clinkering. It is the operation of the rotary kiln, which is far from exact, that handicaps such economic advantages as could be derived from a further increase in the temperature of the flame gases.

The tendency remains to utilize as far as possible the heat of the clinker in preheating the air. Perfection of the feed and storage devices might bring further progress in the operation of rotary kilns.

The more or less Utopian idea of a kiln with perfectly uniform movement and exposure to the flame of the sintering mass would still leave room for the requirement of higher temperatures.

This thought approaches the suggestion, frequently recurring in recent years, of kilns wherein the material as well as the coal is admitted in pulverized form and transformed to clinker while in a state of suspension. Very high flame temperatures are not only desirable, but are a positive necessity in this case, should the heat transfers taking place over intervals of time in the present-day kiln become instantaneous. It remains for practical future tests to offer the solution of the problems whether the combustion gases would be leaving the kiln at higher temperatures; whether the pulverized coal-air mixture with the large quantities of gas produced and reacting but slowly would still be an adequate fuel; and whether the widely different components of the raw mix would have a chance of uniform sintering and would yield a perfect portland cement as their product.

Maximum Burning Capacity and Economy

The maximum quantity of fuel for a given kiln cross section, discussed above, is linked with a maximum quantity of clinker, the two quantities, when simultaneously increased, reaching their limits at the same time. The practical maximum capacity of a kiln depends on the ratio of the diameter to the length of the kiln. Kilns, too short for their width, have a maximum capacity lagging considerably behind the optimum capacity, i. e., capacity with least fuel consumption per barrel. The maximum capacity of long kilns is also the most economical. A kiln 35m. (120 ft.) long, 3m. (10 ft.) in diameter and an ultimate capacity of 1300 bbl. per day (dry process) would yield about 900 bbl. with a fuel reduction of 30 per cent. The flue gas temperature would simultaneously be reduced from 1000 deg. C. (1800 deg. F.) to about 650 deg. C. (1200 deg. F.). Instances of short kilns operated at maximum capacity regardless of fuel economy are more frequently found in practice. These are mostly cases where special conditions require large quantities of steam generated in waste heat boilers.

Comparison of Long and Short Kilns

The length of the kiln is responsible for the rate of utilization of the liberated heat, as indicated by low flue gas temperatures. The above kiln of 10 ft. diameter would yield about 1700 bbl. with a 200 ft. length, operating with the same material (easily sintering) and with a length of 300 ft., about 1900 bbl., with practically the same quantity of fuel, which for a 120 ft. length limits the maximum to 1300 bbl. The relation of length, diameter and capacity will be discussed in a further paragraph, where formulas will be given.

Little difference of opinion exists concerning the effect of increasing the length of the kiln. However, the causes are not always clear and may be illustrated by the observations and computations given below. An indication of insufficient length of a kiln of given dimensions and maximum capacity lies in the danger to the quality of the clinker due to too short a sintering zone. The writer observed that in such kilns, sintering takes place over an average distance of 6 ft., so that thin sheets of material forced ahead begin sintering wherever they happen to stop.

Aside from preheating the air and such factors as could accelerate the heat transfer of a hotter flame and could shorten with regard to time and space the processes taking place in the burning zone, the increased length of the kiln makes the zones recede from the flame. Should equal quantities of fuel and material be used in a longer kiln, a wave of surplus heat would travel in a direction opposite to that of the gases, extending into the burning zone and finding its outlet in overburning the clinker and destroying the lining. The necessary and desired balance is re-established by increasing the quantity of material. For then the zones of heat, following a direct current toward the more distant feed end of the kiln, would be forced back and excessive heat in the sintering zone would be prevented.

The division into zones, measured in distance away from the flame, will not be the same, as they will extend over a longer section, this increase being a percentage of the increase in kiln length. Even the effect of more efficient preheating of the air by the larger quantity of clinker leaving the discharge end does not balance the effect of an increased material charge in the sintering zone. For, taking the above kilns of 35m. and 60m. (120 and 200 ft.) as examples with their respective ultimate capacities of 1300 and 1700 bbl., the additional heat derived from more efficient preheating of the air is at best but 2 per cent, while the corresponding increase in the quantity of clinker is 30 per cent. This illustrates the fact that an increase in the material charge in the sintering zone with an equal quantity of heat liberated above the sintering material, requires a longer period for the heat transfer, in spite of an increase in the temperature of the flame gases of about 30 to 40 deg. C. (55 to 70 deg. F.). When special measures are taken to increase the flame gas temperature, the relations may become like those discussed previously.

The fact that, for the kiln dimensions such as mentioned above, assuming the highest possible burning capacity, the longer kiln is more apt to yield a uniform clinker, together with the demand for big units in connection with large scale production, is responsible for a number of wet process kilns 105m. (340 ft.) in length, placed in operation in different plants in the United States within the last two years.

Meade's Capacity Formula

Different formulas are in use, based on the relation of length, diameter and capacity. Most of these assume that capacity is a function of the length on one hand and of the cross section on the other. One of the most familiar is Meade's formula:

$$C = (\tfrac{3}{4} L + 15) . 0.17F$$

where C = capacity in bbl. per 24 hr.
L = Length in ft.
F = cross section in sq. ft.

Meade refers to this formula in his book published during the past year, saying that it is an empirical formula based on the study of a number of kilns and that it cannot be applied to kilns of very large cross section. He suggests that the large kilns are probably never worked to their ultimate capacity.

It cannot be denied that the establishing of an empirical formula presents many difficulties on account of the widely varying conditions of operating rotary kilns. Aside from the influence of the relative facility of burning different raw materials, the selection of the limit capacity is of main importance. The extent to which certain industrial conditions may affect capacity is illustrated by cases of short kilns provided with waste heat boilers. A kiln of the dimensions mentioned above, i. e., 35m. (120 ft.) long and 3m. (10 ft.) in diameter, was operated at moderate pressure to keep the temperatures of the flue gases down and make its operation economical. The installation of waste heat boilers justified higher flue gas temperatures and produced an increase in capacity of above 30 per cent. These somewhat crude illustrations, based on dimensions no longer encountered in recently built plants, together with industrial conditions, help us to visualize the relation of the long and short kilns better than tables of numerical averages.

Whatever the mathematical relation established between the variables in a formula, it is true that numerical coefficients can be selected to yield correct results over a certain range of values. Whatever the law assumed to govern the processes inside the rotary kiln, it can be correctly established only by perfected measurements. Considering the two kilns mentioned above, operating under identical conditions, it is impossible to find a formula which applies to the short kiln with moderate flue gas temperature and at the same time to the long kiln, whose maximum capacity satisfies all requirements of economic operation.

Formula for Maximum Fuel Efficiency

It appeared advisable for the writer to find a formula treating the kilns from the same viewpoint, namely, in the form of an equation expressing maximum output. Considerations of economy, which obscure this relation, were to be left out of the formula. The short and long kilns discussed above were operated normally yielding an output about 30 per cent below the ultimate capacity. Should other cases have been included, which would have represented less crude illustrations, we can say that kilns of the above dimensions are unusual in the new plants. The new plants seek such kiln dimensions which would guarantee maximum capacity permitting only unavoidable heat losses through the stack, or provided with waste heat boilers generating the required power.

In studying the relation between kiln dimensions and capacity, comparisons of a large number of rotary kilns of all usual dimensions led the author to the conviction that the kiln output is not a linear function of the cross section. Substantiating this opinion were heat computations, which showed that in the case of pulverized coal firing, the fuel efficiency was influenced not only by the gas velocity in the combustion chamber, but also by the surface of the red hot walls. The velocity is a function of the cross section, while the surface area increases with the circumference. This would tend to show that the quantity of fuel and clinker output do not increase as linear functions of the cross section, but that their increase is slower, as demonstrated by numerous practical cases.

Another condition, mentioned above, which requires consideration in establishing a mathematical formula of these processes, is the relation of the increase in output to the kiln length. Formulas assuming a linear relation between output and length, give too high a value for greater lengths of kiln. The square root appears to offer a solution, the output being assumed as a function of the square root of the length. An error in this relation is a slight gain in output for longer dimensions, when gain is no longer registered in practice. This discrepancy is not so important when one considers that the invested capital, required space, etc., render any gain but an illusion.

The conviction that the inside surface of the combustion chamber influences the combustion process, when pulverized coal is used as a fuel, leaves the question open to what extent these peculiar conditions of pulverized coal firing are effective. In trying to establish a scale applicable to practical conditions, the writer proceeded in three different ways: (1) by establishing a formula whose output value was made to increase successively with the square of the circumference, (2) with the 1.5 power and (3) as a linear function of the circumference. The numerical value of the second formula gave the best results. The formula is:

$$C = 0.7 \text{ (up to 0.95) } . P^{1.5}\sqrt{L}$$

Where: C = capacity in bbl. per 24 hr.
P = inside circumference of the lining or coating in feet.
L = kiln length in feet.

It is to be noted that:

(1) The numerical co-efficient is to be selected within the range 0.7 to 0.95, in accordance with the suitability of the material for burning, i. e., the higher co-efficient for more easily sintering material.

(2) For wet process, instead of $\sqrt{L}$, use $\sqrt{0.6L}$ to $\sqrt{0.8L}$, in accordance with the water content of the slurry and special device accelerating the drying of the slurry.

Illustrations of Use of Formula

The peculiarity of the formula may be illustrated by three examples with parallel results by Meade's formula.

1. Kiln (dry process):
   Length 120 ft., shell diameter 9 ft.
   Clear diameter minus the coating 6½ ft.
   Above formula gives 790 bbls.
   Meade's formula gives: 590 bbls.
2. Kiln (wet process):
   Length 200 ft., shell diameter 10 ft.
   Clear diameter minus the coating 8 ft.
   Above formula: 1250 bbls.
   Meade's formula: 1100 bbls.
3. Kiln (wet process):
   Length 330 ft., shell diameter 11½ ft.
   Clear diameter minus the coating 10 ft.
   Above formula: 2150 bbls.
   Meade's formula: 2550 bbls.

This table shows the trend of two formulas based on two different principles. For short lengths and moderate load, Meade's formula yields values frequently encountered in practice with kilns of this type, while the writer's formula gives their kiln capacity. For medium lengths the values of the two formulas are nearly the same. With increasing dimensions, the formula based on the circumference value is closer to practical conditions. Another way of writing this formula, convenient for many computations, is:

$$C = 0.7 \text{ (up to 0.95) } . P . \sqrt{P.L}$$

The Heat Transfer at the Upper End of the Kiln

The above formula assumes that the kiln maintains throughout its length the diameter of the sintering zone. Does the diameter of the upper end of the kiln play an important part in affecting the output? Hardly to the extent that it does in the sintering and calcining zone. Of all the kiln zones, this preheating zone is the least efficient. Changes in diameter could affect the heat transfer but little here, for increasing the diameter would be a step hardly in agreement with the principle, which would tend to improve the heat transfer at low temperatures. The construction of the kiln is based on reactions taking place at very high temperatures.

It is frequently pointed out that the heat transfer increases through convection with the velocity of the gases. Whether this could be utilized to advantage in a rotary kiln, is doubtful. Keeping in mind, that the heat transfer

(Continued on page 114)

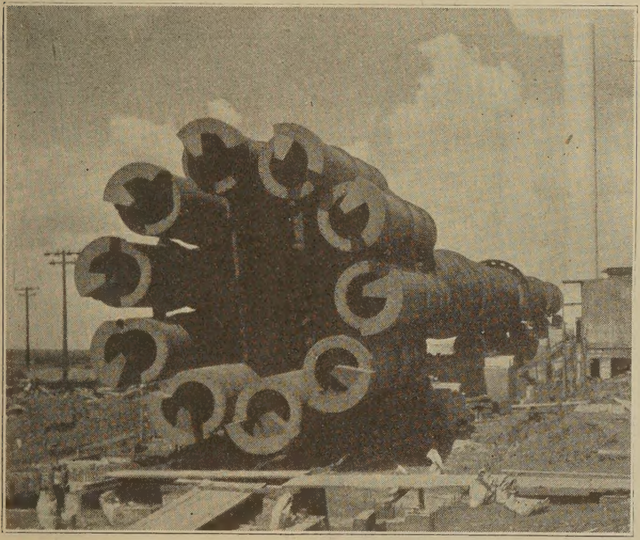
Monolith Portland Midwest Co. Builds New Plant at Laramie

Will Make Portland and "Plastic" Cement—Unusually Favorable Conditions in Raw Material Supply—Details of Plant Layout and Equipment

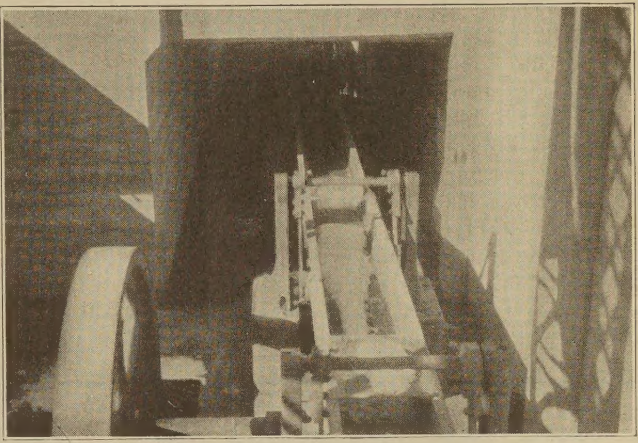
(Concluded from Page 111, January issue)

Centralized Kiln Control

Because of the relatively great distances between the various control devices and the burner's platform, remote control starters are used throughout. All the meters and pushbuttons are centralized on a master control panel located conveniently on the burner's platform. These instruments permit the burner to watch and control every detail of the operation of the kiln department with the least amount of effort and time and thus permit him to concentrate efficiently on the process of burning.

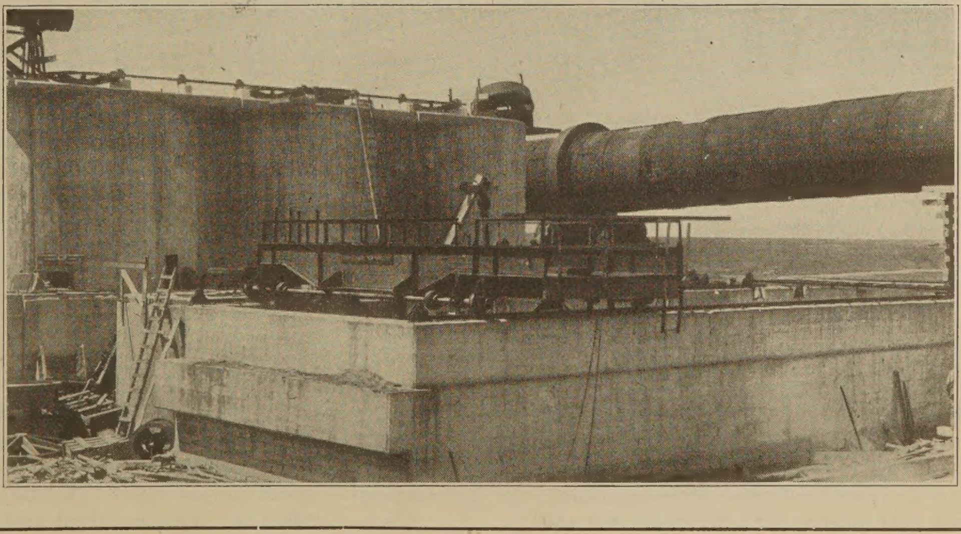


The Unax cooler, which consists of 10 tubular sections arranged concentrically around the kiln



The Skipulter and its drive

This master kiln control panel was designed by and built under the supervision of the electrical engineering department of F. L. Smidth & Co. It is about eight feet long and has on its back a steel box running the full length of the panel. In this steel box are located about one hundred terminal blocks, each numbered to correspond with the wiring diagram and about one hundred control wires terminating at this control board. On the back are also located the various field regulators for the adjustment of the speed of the DC motors. On the front of the panel are located the pushbuttons for the control of all the motors, ammeters, speed indicators, revolution counters, interlock relays, signal lamps indicating the proper working of preceding and succeeding motors, draft gauges, indicating pyrometer, and of course, the hand wheels for the above mentioned field regulators.



The correction basins and the slurry storage basin. The storage basin is equipped with a traveling agitator

At the feed end of the kiln is located an auxiliary panel containing the instruments of two bulb thermometers, one for each of the induced draft fans. These instruments are equipped with electrical contacts which by means of relays, will sound an alarm in case the gases, when passing the induced draft fans, should reach a dangerous temperature, and will cause the operator to open a cold air intake provided on the smoke chamber. On the same panel is also located a test draft gauge with a manifold with test cocks so as to permit the checking of the draft at various points of the system. This is also used for checking the indication of a draft indicator mounted high on the smoke chamber and brilliantly illuminated so it can be clearly observed from the burner's platform by means of a telescope. This draft gauge indicates the draft at the mouth of the kiln.

The Unax cooler discharges the clinker into an F. L. Smidth & Co. Skipulter, which is located in a tunnel between the kiln building and the storage building. The Skipulter discharges the clinker into a bucket elevator which conveys it to the storage building. Here it is picked up by the storage building crane and placed in the feed bin for the finish grinding mill. Adjacent to the bin for the finish mill a bin for gypsum is located. Clinker is withdrawn from the bin by means of a Smidth cradle feeder, while gypsum is handled by a special manganese steel feed screw furnished by F. L. Smidth & Co. This feed screw is operated by an adjustable D. C. motor and a Cleveland worm gear speed reducer. The two feeders discharge into a Smidth three-compartment Unidan mill of similar design to the one used for raw material grinding.

The finished cement is discharged into a 16-in. screw conveyor which discharges into a 6-in. Fuller-Kinyon pump, conveying the cement to the storage silos. Provisions have been made for the installation of an 8-in. Fuller-Kinyon pump at a later date when the capacity of the clinker grinding equipment is increased.

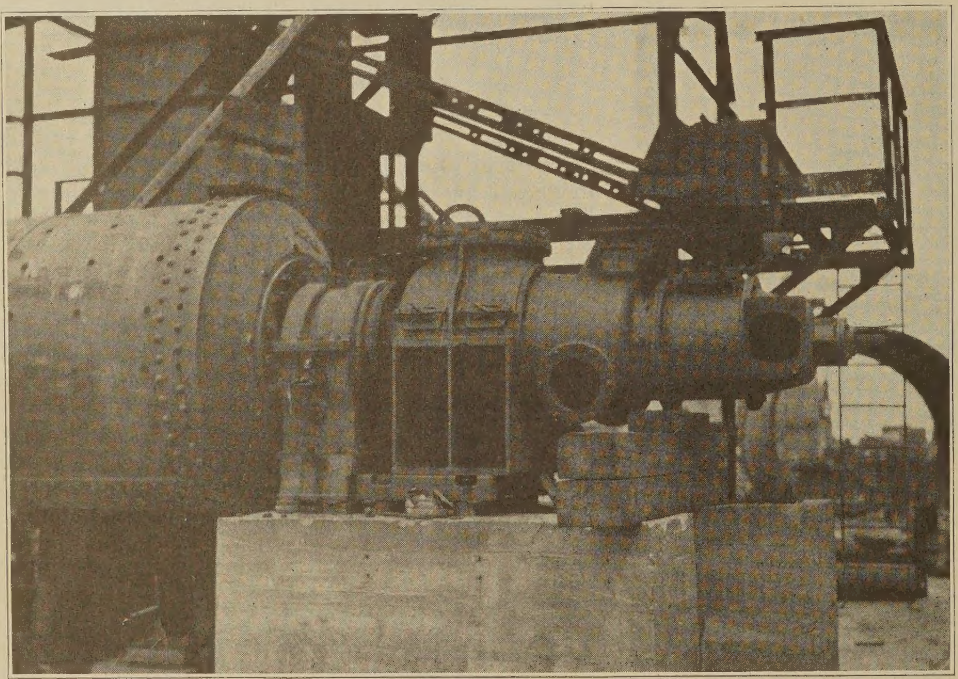
The two Unidan mills provided in the mill building are driven by symetro drives, which eliminate the conventional pinion and master gear drives on the mill.

The symetro drives are specially designed to combine the high efficiency of precision gearing with the higher efficiency of high speed motors as compared with slow speed motors. Each symetro drive is, on one side, coupled to a 600 HP., 720 RPM. synchronous motor of the self-starting type. On the other side each symetro drive is direct coupled to the discharge trunnion of the Unidan mill by means of a specially designed chrome nickel steel torsion shaft with flexible membranes. The speed of the 600 HP., 720 RPM. motor is reduced to 20.6 RPM.

These membranes and torsion shafts prevent the well-known vibrations, characteristic of mills of this type, from reaching the precision gearing. Besides the vibrations and shocks, misalignment due to temperature changes and deflection in the mill, might also be mentioned.

The precision gearing is made of chrome nickel steel gear flanges and pinions mounted in self-aligning precision roller bearings. The gearing is provided with a system of pressure lubrication with settling tank and oil filters.

These patented symetro drives, as well as the membrane couplings with torsion shafts, were designed and manufactured by F. L. Smidth & Co. Protective and interlock panels are provided here, as well as throughout the plant so as to insure the proper sequence of starting and stopping of the various units working together. The lubricating system for the symetro drive is also tied in with this protective system so as to cause stoppage of the unit in case of failure of the lubricating system.



The feed end of the pyrator. Coal is ground and dried by means of heated steel balls

Electrical Equipment

The power house and the entire electrical equipment of the plant were designed by and manufactured in accordance with specifications of the electrical engineering department of F. L. Smidth & Co. Twenty-two hundred volts are used for A.C. motors of 50 HP. and above. Of these twenty-two hundred V. motors the greater part are of the synchronous type. The balance of the A.C. motors are 440 volt. Two hundred and fifty KW synchronous motor-generator sets are installed in order to supply the 230 volt D.C. motors as well as the excitation for the synchronous motors. Normally one unit is a spare and provided with a gasoline unit for emergency operation in case of failure of power.

The power is purchased from the Western Public Service Company at Laramie, Wyoming, and is transmitted from their steam plant as 13,000 volt, 3 phase, 60 cycle alternating current and is stepped down to 2300 volts by means of a bank of three 833 KVA transformers located west of the plant. A double transmission line has been provided between the power company's plant at Laramie and the transformer station at the cement plant so that in case of trouble with the one line the other would carry the cement plant.

The bag cleaner on the third floor of the packhouse

The 2300 volt power is brought underground by means of lead covered cambric cables in fibre ducts to the basement of the power house, located in and forming a part of the mill building.

In this basement are located all of the 2300 volt and 440 volt oil circuit breakers, as well as a bank of three 333 KVA, 2300/460 volt step-down transformers. In the basement is also located a bank of capacitors to be used only during the starting of the large synchronous motors.

The main switchboard is located right above this basement. It is exceptionally long for a plant of this size, namely 44 ft., because it is designed to serve the purpose of feeders for the various mill departments, as well as starting and control panels for all of the synchronous motors in the plant.

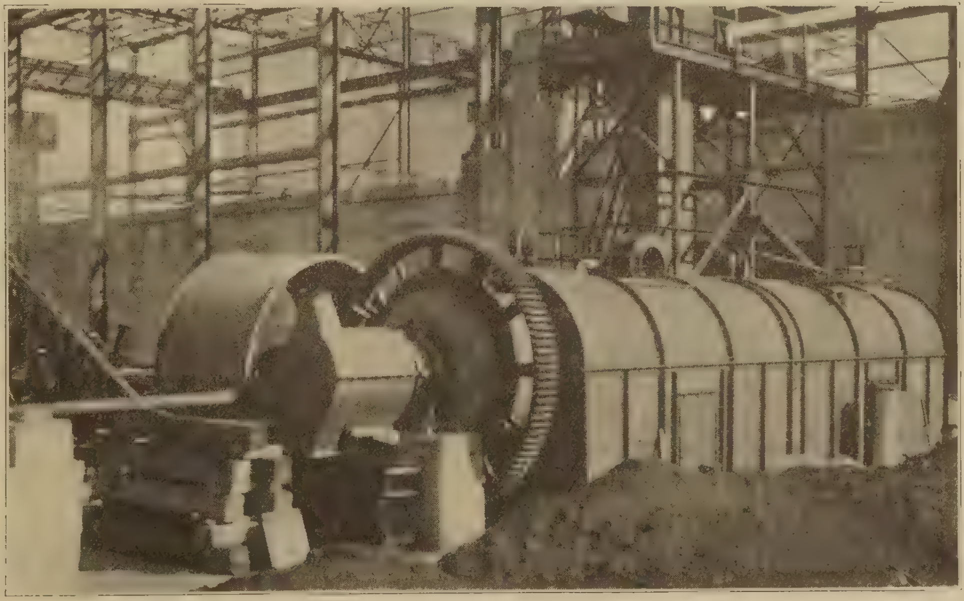
The oil switches in the basement below the switchboard are so located that they correspond with the panels and the operating mechanism from the panels to the breakers becomes a very straight and simple one.

Practically all of the power for the cement plant is controlled from this main panel and as a consequence the operator has full control over the maximum demand. The maximum demand is recorded by two maximum demand indicators and two kilowatt-hour meters, one belonging to the cement company and one to the power company. The one belonging to the cement company is, however, arranged with an indicating device for a shorter time than that of the power company, also with an alarm device so as to give the operator proper warning in case the maximum demand should get close to any predetermined value.

Because of the limited capacity of the steam plant of the power company and the comparatively large size of the 600 HP. synchronous motors, it became a problem to find a satisfactory solution of the voltage regulation during the starting of these large motors. The above mentioned capacitors were provided to take care of the low power factor incidental to the starting of the large synchronous motors. These capacitors are used only during the period of starting and are sub-divided, each sub-division controlled by a frequency relay so the action of the capacitor is automatically regulated during the period of starting, each section being cut out as the frequency reaches a predetermined value. The many smaller synchronous motors are also expected to act as flywheels during the starting of the larger motors and help to give the voltage regulators of the steam turbines a chance to pick up the load of the large units.

A small 230 volt storage battery located behind the main switchboard has been provided for emergency lights in case of a sudden power failure and for the control of

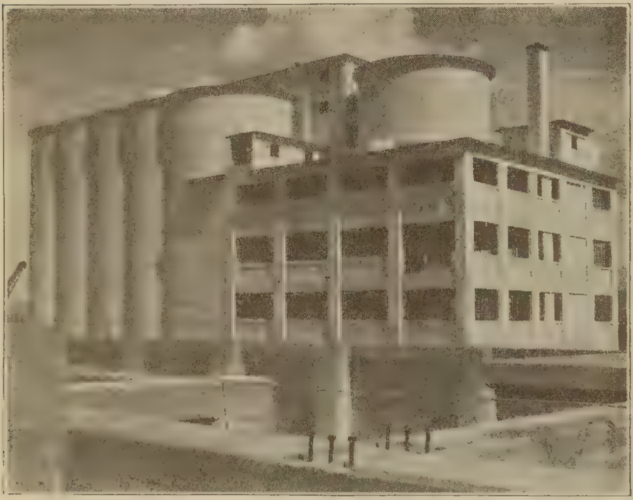
The pyrator in the coal department. This machine grinds and dries the coal in one operation



the overload trip relays of the main switchboard.

All large synchronous motors were furnished by the Electric Machinery & Manufacturing Company, Minneapolis, Minnesota, who also furnished the capacitors and the automatic relays for their control. The main switchboard, all of the starting equipment, the two motor generator sets and all motors except those mentioned above, were furnished by the General Electric Company. All power cables were furnished by the Standard Underground Cable Company.

The three compressors at the plant, one located in a compartment below the correcting basin, one located in the mill building and one located in the machine shop, are all operated by direct connected self-starting across-the-line-type synchronous motors. These motors, as well as the pyrator motor in the coal mill and the 600 HP. mill motors, are, as mentioned, controlled from the main switchboard in the west end of the mill building; a small control panel is mounted next to each motor and has mounted a signal system with return signals. The three Ingersoll-Rand compressors are equipped with a solenoid operated unloading device which may be manually operated by means of a small switch on the main switchboard or operated automatically by means of a special frequency relay. This will automatically unload the compressor in case of a voltage drop on the line, causing the compressor motor to fall out of step. When thus unloaded, the compressor motor will regain its speed, but the load will not be put on again until the motor is up to synchronous speed, when the frequency relay will automatically release the unloader.



The packhouse and finished cement storage silos

Cement Storage and Packing

There are six silos, each 32 ft. in diameter by 80 ft. high, which, with the interstice bins, provide a capacity of 120,000 bbls. of finished cement. Four tunnels are built under the silos, in each of which is located a 16-ft. screw conveyor. The cement is withdrawn from the silos by F. L. Smidth Exbiners, and discharged into the screw conveyors.

The packhouse is a four-story concrete building in which two 3-spout Bates packers will be located. Provisions are made for the installation of two additional 3-spout packers.

The silo screw conveyors discharge into 20-in. collecting screw conveyors which in turn discharge into bucket elevators which bring the cement to pebble screens and to the 20-in. distributing screw conveyors located on the third floor of the packhouse. In this entire conveying system there are duplicate machines of each kind. The main reason for installing this duplicate conveying system is that the Monolith Co. will manufacture, in addition to their standard brand of portland cement, a so-called "plastic" waterproof cement. Any possible mixing of the two brands of cement through the carelessness on the part of any operator is thus avoided. In addition to being a safeguard, the duplicate conveying system insures constant operation of the packing equipment in case of a breakdown in any part of one of the systems. By-passes have been provided permitting easy switching from one part of one conveying system to consecutive parts of the other.

In addition to the packing equipment, a 2-ton freight elevator was installed in the packhouse for handling the returned bags. These bags will be cleaned by a Bethlehem Foundry & Machine Co.'s continuous bag cleaner having a capacity of 5000 bags per hour, and located on the third floor of the packhouse.

Sly dust arresters are provided for the bag cleaner, as well as for the two packing machines. Provisions have been made for the installation of additional arresters when the two future packing machines are placed.

Coal Supply

As mentioned before, the coal is received in railway cars and dumped into a track hopper from which it is brought into the storage building by means of an elevator. From the storage building, the traveling crane brings the coal to the feed bin at the coal mill. A 20-in. wide, 16-ft. long Schaffer poidometer is provided below the coal bin and conveys the coal to the inlet of the F. L. Smidth Pyrator. This machine grinds as well as dries the coal in one operation by means of heated steel balls. The coal discharged from the pyrator is handled by a 12-in. screw conveyor to a 6-in. Fuller-Kinyon pump, which conveys the powdered coal to the kiln bin.

Water Supply

The water for operating the plant is obtained from a well approximately 1625 ft. deep. In addition to this well, another well approximately 1350 ft. has been driven as a standby. They will be equipped with Ingersoll-Rand air lifts which will discharge into a reservoir located close by. From this point two centrifugal pumps will deliver the water to a 100,000-gallon concrete tank located above the packhouse.

In order to conserve as much water as possible, a reservoir having a capacity of approximately 50,000 gallons will be located west of the plant. All cooling water from the compressors in the plant, as well as water from water-cooled bearings, will be accumulated in this reservoir, from which it may be pumped into the mill feed tank located in the mill building adjacent to the Unidan mill for raw grinding.

All the buildings with exception of the office and laboratory building and the machine shop building are steel frame construction covered with corrugated asbestos which was furnished by Eternit Co. All roofs of the flat slab type and the precast tiles for same were made at the plant site.

F. L. Smidth & Co., of New York, are the engineers, and the Macdonald Engineering Co., of Chicago, are the contractors.

Officers of the Monolith Portland Midwest Co. are: Coy Burnett, president; Carrol A. Low, vice president and general manager; J. J. Calkins, secretary and treasurer; W. S. Trueblood, production manager, and F. W. Anderson, superintendent.

~ EDITORIAL ~

Transporting Cement

FAVORABLE transportation conditions are as much a matter of trade advantage as are better manufacturing facilities. During the last few years particularly, they have become of increasing importance in the cement industry. Their importance will, it is reasonable to expect, grow rather than diminish in the future.

When cement is moved from the mill to the job in such a manner as to eliminate some of the handlings —either into and out of railroad cars, into and out of warehouses or into and out of small packages— reductions in the actual cost of getting the cement to the consumer have been made.

In the manufacturing end, great pains are taken to avoid any unnecessary rehandling of the product or the raw materials. This is recognized as one of the cardinal principles of economical production and has long occupied the attention of manufacturers. Yet the matter of cement transportation and handling from the storage silos to the job, which affects ultimate costs very considerably, is only beginning to receive the attention it warrants.

It was once thought impractical to convey ready-mixed concrete directly from a central mixing plant to the job. Then it was thought that for certain types of work under certain limiting conditions, it would be possible to do so. Now central mixing plants will supply concrete for almost any use in almost any quantity desired and will do it economically. It was necessary only to develop equipment suited to the task.

Not many years ago, it was thought that the only practical method of hauling milk from the farm to the dairy was in individual cans, hauled to the station, loaded in box cars and then hauled to the dairy. Now big refrigerator trucks with trailers haul a carload of milk without the need of the intermediate handlings.

Is it not possible that similar important developments in the transportation of cement may be expected? Certainly, the possibilities for more economical handling from storage silo to contractor's bin have not yet been exhausted. In only a comparatively few instances have direct transportation methods, in which some of the many handlings are eliminated, been used.

The subject of economical transportation of cement deserves as careful and prolonged study as has already been given to manufacturing methods. Equipment must be developed that will make it possible to carry into execution any plans for better transportation methods that may be found.

A Step Toward a Standard

IN merchandising one of the brands of high early strength cements, the manufacturers are stating in definite terms just what is meant when that cement is called a special product.

This is a step towards a general high early strength specification which must develop in order to make possible a proper confidence on the part of the construction public in these new or improved portland cements that are on the market today.

The standard or "guarantee" which is given the users of this brand of cement may be summed up in the statement that standard 1:3 mortar briquettes must show a tensile strength of 250 lbs. per sq. in. at 24 hours and 350 lbs. per sq. in. at 48 hours, and that the finished product is ground to a fineness that will not have more than 10 per cent residue on the 200-mesh sieve.

Though this is not claimed to be a complete specification for high early strength cements, it does definitely specify those points by which the cement in question exceeds the standard specifications. It is a commendable move to tell the buyer just what he may expect.

It is very evident that the average contractor is very much mystified on the subject of high early strength. The discussion that followed a paper on this subject at the Road Show indicated this conclusively. There is no clear differentiation in his mind of the difference between high early strength concrete, high early strength portland cement and high alumina cement.

A new standard specification for high early strength portland cement would do much to clarify the matter for the user. He would then be able to choose his cements on a definite basis.

The fact that a sub-committee of the American Society for Testing Materials is giving this matter consideration holds promise. A standard specification that will serve as a guide for all users regardless of the particular brand they buy, is urgently needed.

Coplay Opens 1929 Safety Drive with Enthusiastic Meeting

Over two hundred employes attended a highly enthusiastic safety first meeting held on January 4th at the plant of the Coplay Cement Manufacturing Company at Allentown, Pa. Acting Chairman Chas. L. Haas, of the plant safety committee, opened the meeting and spoke on the activities of his organization.

This was the first meeting held in the Lehigh Valley by the Department of Labor and Industry, State of Pennsylvania, in connection with the department's 1929 safety drive, and was addressed by T. J. Quigley, who is chief of the quarry section of the Pennsylvania Department of Labor. He spoke on accident prevention work and stated that no industry in Pennsylvania is doing more for accident prevention than the cement industry.

D. J. Uhle, operating manager, complimented the men on their excellent record during the past twelve months and called attention to the safety work throughout the various departments. He then appealed to the men for their support in the company's effort to make the year 1929 "a no lost time accident year."

H. E. Mick, assistant operating manager of the plants, was the next speaker and called upon the men for their constant co-operation in safety work throughout the year 1929.

During the year 1928 the company had a record of three lost-time accidents in all of its various operations, resulting in a time loss of four days.

Petoskey to Build Warehouses in Three Cities on Great Lakes

A building program to be inaugurated shortly by the Petoskey Portland Cement Company, Petoskey, Mich., will include three 55,000 bbl. stock silos located at Detroit, Chicago and Milwaukee and remodeling of the loading plants at Petoskey to provide for bulk shipments of cement to these cities. Plant sacking and cleaning departments will be installed at each.

The freighter J. B. John, is to be rebuilt at the Manitowoc, Wisconsin, shipyards during the winter so that she may carry cargoes of bulk cement instead of sacked cement as originally provided for. Complete loading and unloading machinery is to be installed. The change in the shipping system is expected to shorten the loading and unloading time by almost 100 per cent and to save from 10 to 12 hours on each operation. The ship will thus be able to make more trips and eliminate the necessity of leasing other freighters.

Work of rebuilding the steamer J. B. John will be completed by the opening of navigation in the spring. The stock houses and machinery in each city will be completed by that time.

The plant at Petoskey will be kept in full operation all winter, except for a short time for annual repairs to the machinery.

Perfect Safety Record in Five Lehigh Plants

Five mills of the Lehigh Portland Cement Company have been operated through the year 1928 without a lost time accident. The plants are Ormrod No. 3, William Montz, superintendent; Fogelsville, Ray Moritz, superintendent; Bath, Homer Heller, superintendent; Sandts Eddy, James Gish, superintendent; Iola, Kansas, C. A. Swiggett, superintendent.

Accidents in quarries are being eliminated also. The Ormrod quarry, which supplies the three Ormrod mills, has had no accident since November 19, 1926. Several of the others of the Lehigh organization have had but one or two accidents. Of fifteen plants operated, there has been only one fatal accident in the Lehigh Portland Cement Company during the past year.

Dewey Presents $21,000 in Bonuses to Employes

Employes of the Dewey Portland Cement Company met on the evening of January 7th in the Dewey Recreational building at Bartlesville, Okla., in their annual bonus dinner. The company distributed more than $21,000 as bonuses to approximately 239 persons on this occasion. F. E. Tyler, president, and H. F. Tyler, vice-president, of the company were the guests of the evening. Entertainment was provided.

The annual bonus is in line with the company's policy of a graduated bonus for all employes who have served more than one year and up to five years with the institution.

International Subsidiaries Change Names to "Lone Star"

The names of the domestic subsidiaries of the International Cement Corporation are officially changed to the Lone Star Cement Company of the state in which each company is located, according to a statement issued by H. Struckmann, president of the International Cement Corporation. This change, which became effective January 1, directly identifies each company with its product, Lone Star cement, and makes the subsidiary company names uniform throughout the United States. This change affects only the name of the company. There is no change in the management, policies or products.

New Hercules Plant for California

A tract of 102 acres of land has been purchased near Torrance, south of Walteria, California, on which the Hercules Cement Corporation plans to erect a cement plant costing about $4,000,000. Ground will be broken not later than April 1st and completion and operation are expected by December 15th.

The first unit of the proposed plant is to cost $2,500,000 and have a capacity of 5,000 barrels. A second unit of 2,500 barrels will be constructed later.

H. H. Helbush & Company of Los Angeles are in charge of the project, with G. S. Moore as manager.

Lehigh Plant at Mitchell Closes Down; No Opening Date Given

The Mitchell, Indiana, plant of the Lehigh Portland Cement Company shut down shortly before Christmas and contrary to custom, no date was set for reopening. It has been customary for the plant to shut down for a few days or a week at Christmas time. This year, however, nothing was said regarding resumption of work.

Atlas Reopens Mill

The Atlas Portland Cement Company mill No. 2 at Northampton, Pa., resumed operations on January 15th. It had been idle since August.

Huron Expanding

The Huron Portland Cement Company is scheduled to begin work immediately on a new unit to its Alpena, Michigan, plant.

Grinding Raw Materials and Clinker in the Modern Cement Plant

A Study of Some Factors That Influence Grinding Costs —Two Unit Reduction vs. Single Unit Reduction—Preliminary Grinding—Equalizing Preliminary and Final Grinding

By A. W. CATLIN
Bradley Pulverizer Co., Allentown, Pa.

INSOFAR as general principles are concerned, we find today no marked departure from the grinding methods employed in the earlier plants, other than a very decided tendency toward the adoption of larger units and an ever-increasing demand for greater fineness in both raw mix and finished cement. At the present time it is not unusual to approach a fineness of 90 per cent through the 200-mesh sieve on the raw side, while on the finish side a fineness exceeding 90 per cent is frequently encountered.

The reduction of raw materials in the dry state to a fineness of 90 per cent through 200 mesh is more difficult of accomplishment than is the reduction of cement clinker to the same fineness, yet the grinding of clinker, because of its abrasive qualities, is possibly the most searching test to which a grinding mill may be subjected.

Preliminary Grinding

The type of grinding units employed is the determining factor with respect to the preliminary work which must be expended on the materials before the actual grinding operation takes place. It is obvious that a raw grinding unit which requires a feed of ½ in. to ¾ in., as against a unit which will handle efficiently a feed up to 2½ in. or larger, must of necessity increase reduction costs, which increase might properly be charged to the grinding units themselves. Where a fine feed is necessary, the number of secondary crushers or hammer-mills is augmented, requiring additional power, to say nothing of the expense and labor involved in keeping these secondary units set up to the point where a proper size of product may be maintained. This is a feature of cement plant grinding which apparently has received insufficient consideration at the hands of operators.

Inasmuch as the grinding operation in a cement plant is virtually a continuous performance, 24 hours per day, and the horsepower consumption involved in this operation is greater than all the other power requirements of the plant combined, due regard should be paid to the foregoing consideration in making a selection of the grinding method to be employed. A summary of the requirements should include the following, not necessarily listed in the order of their importance: Reliability of operation, low maintenance cost, ability to handle a coarse feed, and economy in power consumption.

Too often, however, we find that scant attention is paid to these desiderata, particularly the last mentioned item, when waste-heat power is available, and cement plant designers are prone to indulge in the specious argument that an abundance of power is at hand, costing little or nothing, so why not use it as extravagantly as they like?

Having regard to the fact that in the grinding of cement materials a very high ratio of reduction is necessary, dealing with the product from crushers and hammer-mills on the one hand, and kiln run of clinker on the other, it is customary to effect the grinding in two or more stages, employing either single-unit or two-unit reduction.

Two-Stage Reduction

In two-stage reduction, particularly where two units are employed, the usual procedure is to draw a line at 20-mesh between the work performed by the preliminary and finishing units, that is to say, the preliminary mill reduces the material to a state of subdivision approximating 20 mesh, and leaves to the finishing grinder the duty of pulverizing this 20-mesh product to the required fineness.

It is true that some grinding mills, notably the Griffin mill, are able to perform the entire reduction in one operation; at the same time they are equally well suited to preliminary grinding. Taking advantage of this fact, we are able to determine with a considerable degree of accuracy the actual amount of work involved in preliminary grinding as compared to that imposed upon the finishing unit, thereby establishing at once the relative efficiencies of the various types of grinding mills.

For example, knowing as we do that a Griffin mill equipped with a comparatively coarse screen and operating as a preliminary grinder, will grind practically twice as much as the same mill will handle when making the total reduction in one stage to a fineness of 82 to 84 per cent through 200 mesh, it follows that the preliminary reduction represents one-half the total work performed.

In support of this statement the following capacity figures are quoted, these being taken from plant operating records and cover both wet-process and dry-process cement clinker.

GIANT GRIFFIN MILL OPERATION

Preliminary Grinding	Finish Grinding
Average of 7 plants	Average of many plants
26.6 bbls. per hour	13.5 bbls. per hour

A screen analysis of the product from a Griffin mill operating as a preliminary gives the following average results:

Through	Per Cent
20 mesh	90-95
100 mesh	55-65
200 mesh	40-50

For reasons already mentioned governing the selection of grinding machinery for the cement plant, particularly reliability and low maintenance cost, the tube mill is widely employed for finishing purposes. Its efficiency is not high but nevertheless it has come to stay. Given a feed whose screen analysis conforms to the figures just mentioned, and performing one-half the total work involved in the grinding operation, its relative efficiency is in the neighborhood of 60 per cent, taking the better class of grinding mills used as preliminaries as representing 100 per cent efficiency.

Selecting for example a popular size of tube mill, namely, one 7 ft. in diameter by 26 ft. in length, we can assign to it, under the most favorable conditions of operation, a maximum rating on clinker of 137 bbls. per hour, when grinding to a fineness of 82 to 84 per cent through 200 mesh. A motor of 500 h.p. nominal rating is required to drive this mill, consequently its best performance—seldom attained in practice—is the production of 1 bbl. of cement for 3.65 connected motor horsepower.

Having accepted the tube mill as a necessary unit in the modern cement plant, and keeping in mind its power requirements, let us now investigate preliminary grinders which may be used in conjunction with it, with a view to obtaining a desirable combination. Looking the field over, we find that the industry distinctly favors two types of pulverizers, the centrifugal roller mill and the ball mill.

In the more recent plants, it is customary, when a ball mill is employed, to couple it directly to the tube mill in the form of a compound unit or compartment mill, placing a partition grid between the two. In any case, whether the ball mill be a separate unit of the trunnion type or whether it should form the first compartment of a compound unit the principle is the same, and we cannot ascribe to it an efficiency appreciably higher than that which we assign to the tube mill itself.

Investigating the centrifugal roller type of mill used for the purpose of making the preliminary reduction of cement materials, we find that the Hercules mill is widely used. The product from this mill coincides with that obtained from the Griffin mill under the same conditions of operation. The Hercules mill, however, possesses certain advantages over the Griffin in the fact that its capacity is from six to eight times as great, and it is unique in its ability to handle kiln run of clinker and raw materials up to 2 or 3 in. in size, due to the type of feeder employed, the liberal dimensions of feed openings and other important contributing features. Not only does it produce a more suitable tube mill feed than does the ball mill, but it has also the most essential element of flexibility, permitting a perfect balance with the tube mill following it.

Power Requirements

With reference to the capacity and horsepower requirements of the Hercules mill, a tabulation of results from 28 plants employing this mill for the purpose of making a preliminary reduction of clinker, both wet-process and dry-process, gave 2.25 h.p. in connected motors per barrel. Comparing this figure with that obtained for tube mill operation, namely, 3.65 h.p. per bbl., we find the relative efficiencies of the two mills are as 100 to 62.

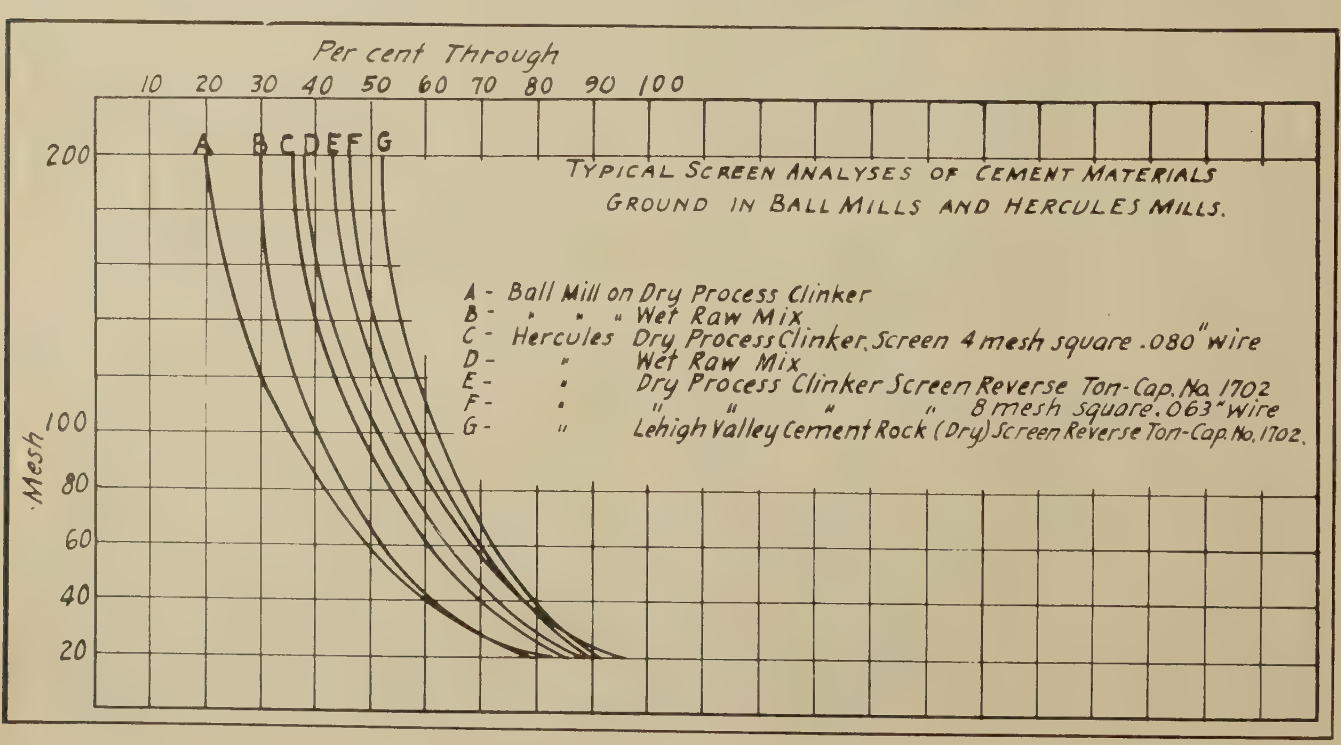
If we deal with the actual horsepower requirements of the two machines instead of comparing them from the standpoint of connected motor capacity, we cannot alter these figures in favor of the tube mill. It is hardly conceivable that we can grind 137 bbls. per hour with a tube mill of this size without loading it to the full capacity of the motor, whereas the tabulation of Hercules performance in the 28 plants just referred to gives a barrel of output for an actual horsepower consumption of 2.12.

Tube mills in combination with Hercules mills have been known to attain what we may term their maximum theoretical capacity, but it is extremely doubtful if they could have done so when grinding a ball mill product. The reason becomes immediately apparent if we examine the screen analyses of tube mill feeds from these two preliminary grinders. The accompanying diagram prepared from actual operating data and tests discloses a considerable difference in the fineness of the products. (Insert Screen Analysis Diagram here) !*!*!*!*

Upon referring to the diagram it will be observed that the ball mill product screens considerably less than that from the Hercules through all meshes, and this characteristic naturally reacts adversely on tube mill capacity and fineness.

It is hardly necessary to say that coarseness in tube mill feeds is bound to exert a detrimental influence on tube mill performance. The primary purpose of a grinder is to grind, and the more work done by the preliminary unit the greater the output of the mill following it.

Experience also teaches us that in order to obtain high



fineness in the tube mill, we must have a relatively high fineness in its feed, and if we are to eliminate oversize in the finished product, we must reduce to the lowest practicable limit the oversize on 20 mesh in the product from the preliminary grinder.

Unfortunately, we cannot forecast with certainty what a given grinding mill will do in terms of barrels of cement or tons of raw mix ground, for the reason that the grinding characteristics of these materials differ widely in various plants, and moreover, they will vary considerably from time to time in any one plant. A clinker in one plant may grind readily in the preliminary reduction and at the same time be most difficult to finish. In another plant the exact reverse may be true and the preliminary units may carry the burden of the work, leaving to the finishing mills a much lighter duty to perform.

It is evident, therefore, that some method of equalizing the work between the two units is quite necessary. It is most desirable also to be able to effect this equalization in a simple and expeditious manner. When, however, it becomes necessary to balance the work of one compartment against another in the modern compound grinding mill, employing one or more partition grids, a laborious task is presented. In the case of the Hercules mill a proper balance is easily obtained by the simple expedient of changing the mill screen, substituting one of different mesh, the whole proceeding requiring less than half an hour.

In this connection the reader is again referred to the screen analysis diagram which clearly illustrates the possibilities in this direction where Hercules mills are employed as preliminary grinders. Operators of Hercules mills, recognizing both the necessity of balancing units and the ready means at hand, make it a practice to carry in stock two or more standard screens of varying mesh, changing screens when the advisability of doing so becomes apparent, thereby maintaining their grinding units at their highest efficiency and at the same time assuring a satisfactory finished product.

The principal advantage claimed by advocates of the compartment mill is that it tends to simplify plant layout, admittedly true. It is also true that it possesses certain inherent disadvantages as already mentioned. In the laudable endeavor to make it a more efficient and flexible unit, numerous schemes involving air separators, external screens and additional fine crushers ahead of the mill are being tried out in the hope that a satisfactory performance may be obtained without unduly increasing power consumption, already high. While these additional features undoubtedly enhance the performance of the mill, it may be said that they do not carry out the primary object of simplicity.

Experience has shown that with a suitable feed, a good average length for a tube mill is 22 ft., and that the useful work performed beyond a point 20 ft. from the feed end is accomplished at a considerable sacrifice in efficiency, due to the cushioning effect of the material already impalpable which prevents a direct action of the grinding bodies on the coarser particles. If we endeavor to increase fineness in the ordinary way by increasing the length of the mill, the effort required is out of all proportion to the results obtained.

We can cite cases where mills considerably shorter than 22 ft. are meeting all requirements as to capacity and fineness, adding, however, that they are not grinding a ball mill product. For example, at one plant dry-process clinker is being ground in 6 ft. by 16 ft. tube mills at the average rate of 65 bbls. per tube mill hour finishing to 84 per cent through 200 mesh. In another plant tube mills measuring 6 ft. 5 in. by 19 ft. 4 in. inside of shell, grind an average of 90 bbls. per mill hour at a fineness of 82 to 85 per cent through 200 mesh.*

If we are to provide a margin of safety, we cannot go much under 22 ft. in length. In fact, we find in modern plants mills of the compartment type whose *overall* length does not exceed 22 ft. The results obtained by the use of these short compartment mills are naturally what might have been expected, the finished product invariably carrying a high percentage of oversize, or "spitzer," which even if screened out did not alter the fact that the finished material could barely meet the most liberal interpretation of the fineness specification.

Now that it is becoming fashionable to resort to extreme fineness of grinding both on raw materials and clinker—a practice we nowise condemn—the pendulum is swinging in the other direction, and it is a question whether, in the cement plant of the future, the grinding mills or the kilns will attain the greater length.

A rational view of this problem of fine grinding indicates that good practice does not dictate the use of mills of great length. First of all we can make certain that the tube mill has a proper feed, when if it still fails to meet the exacting demands for increased fineness, we have left open to us the opportunity of increasing its effectiveness without adding inordinately to its length. There is no reason why it should be considered necessary to burden the mill with material already sufficiently ground in the preliminary pulverizer which may be removed. It is quite feasible to separate the fines from the preliminary mill as well as the finished product from the coarser residue at the tube mill discharge and return the oversize in closed circuit for regrinding, both of these methods having already been put into successful execution.

---

*The reader may be interested, for the purpose of comparison, in taking these mills and converting them into compartment mills by adding the usual preliminary grinding compartment about 6 ft. in length, and then rate them on cement clinker. Under the most optimistic rating, it is quite evident that the tube mill compartment of the combination will fall off in capacity to a very marked extent, showing conclusively the pronounced influence of the preliminary grinder on tube mill performance.

Oregon Portland Gives Men Christmas Bonus

The Oregon Portland Cement Company held its annual party for employees and their families on December 29th at Lime, Oregon. Following a moving picture theater party, the group gathered at a hall where Superintendent J. M. McClenahen spoke briefly to the men, and presented each with a substantial check as a bonus.

Ideal to Extend Its Railroad

The Ideal Cement Company of Denver, owners of the San Luis Southern railroad, running from Blarca to Jaraso, Colorado, have filed incorporation papers in New Mexico, for the purpose of extending the railroad from Jarosa to Questa, New Mexico, about twenty-two miles.

Bessemer Dividend

The Bessemer Limestone and Cement Company has declared its regular quarterly dividend of 75 cents a share on the class "A" common stock and a dividend of $2.50 on the "B" stock.

Kiln Problems

(Continued from page 104)

by convection increases with the 0.8th power of the velocity, no further advantage can be revealed. For when the length is not increased, the loss of time during which the gases are in contact with the material cannot be balanced by the increase in the heat transfer by the 0.8th power.

In other words, the velocity factor can be usefully increased even when the travel distance factor is increased. The waste heat boiler design is based on this principle. Its use for rotary kilns by reducing the diameter or increasing the length is not advisable, for it would hardly reproduce the conditions of a system of long thin tubes through which the material is to be conveyed. The resulting draft conditions would reduce the output of the burning zone, assuming that no change in excess air was intended. Special power devices for correction of draft conditions would increase the quantity of dust carried off by the flue gases.

The best shape for a kiln, therefore, appears to be one of uniform diameter throughout. As the cross-section of the burning zone also determines the quantity of fuel, kilns whose diameter remains unchanged frequently receive an extension of the sintering zone in order to increase the capacity. As a flame too large for the velocity in the narrow part of the kiln would have difficulty in spreading beyond the cone, the danger of incomplete combustion and forced operation with excessive fuel consumption naturally sets limits to such cases. This also entails a lack of elasticity, which is apt to be felt during times of variable demand, being the more apparent the shorter the enlarged zone and the greater the load on the kiln. As the processes in the rotary kiln—the combustion and the formation of zones of the material—are in a state of greater or lesser longitudinal fluctuation, such elasticity permitting an occasional enlarging of the flame is of advantage. This means, that in a kiln of uniform cross-section or in one with a gradually reducing zone, the quantity of fuel and the draft may be increased without fear of having part of the additional fuel unburned. This possibility for forced operation is an advantage, although the temporary higher output is paid for by a higher fuel consumption per barrel. When the coal remains unburned, the power of the flame has reached its limit and underburned clinker is the result.

To complete the discussion of the rotary kiln as dryer and preheater the rate of feeding and the radiation losses should be considered also, the former being a factor which retards the heat transfer for small diameters, while the latter increases with increasing circumference.

New Cement Producing Firm for Southern France

A cement producing plant will be erected in the cement and bauxite fields along the Mediterranean coast, near the port of Toulon, by the newly incorporated firm Societe des Chaux et Ciments de Toulon et du Var. The organization, which is capitalized at 1,500,000 francs, will produce cement, lime and bauxite.

South Dakota State Plant Sales in 1928 More Than Doubled

The sales of the state-owned cement mill of South Dakota for the year 1928 amounted to 508,844 barrels. This compares with 374,262 barrels sold during 1927.

Los Angeles Mountain Park Company Incorporates; Validity of Plant Remains Question

Definite assurance that the Los Angeles Mountain Park Company, backers of the proposed cement plant and quarry project in the Santa Monica mountains, is going ahead with its plans is seen in the filing of articles of incorporation with the county clerk on January 10th. Alphonzo Bell, owner of the property and chief backer of the project, was not named as one of the incorporators. He is, however, to receive one-third of the stock of the company, it is said.

This move was made while the War Department still has under consideration the company's application for the extension of a pipeline into Santa Monica bay and while numerous protest meetings have been held by property owners in the Beverly Hills, Santa Monica, and Pacific Palisades districts.

Meanwhile the attorney-general of California and the state engineering department are engaged in studying the question of the state's jurisdiction over the tide and shore lines the company proposes to use.

Southwestern Prepares for Increased Production

The Southwestern Portland Cement Company has embarked upon an expansion and improvement program to cost $195,000. Capacity will be increased 200 barrels a day at its El Paso, Texas, mill, making the total 3200 barrels. The plant has been running at full capacity since early last summer.

An electric precipitation plant, costing $75,000, was recently put into operation. Work was started on an $100,000 extension of the power house. A new Westinghouse turbine was to have been delivered during January and it is expected that by the middle of February the new power plant will be in operation. The burning zone of the third kiln at the plant is being increased 50 per cent at a cost of $20,000.

British Clinker Received at Los Angeles

Seven thousand tons, the first of one hundred thousand tons, of crude cement rock, arrived at the harbor of Los Angeles, California, on January 2nd, on the British steamer Bridgepool, from Shields, England.

Establishment of the new trade followed a recent decision by the secretary of the treasury ruling that all unground or unprocessed gypsum or cement rock may be imported without duty.

National Portland Cement Company Organized to Make White Cement

The National Portland Cement Company, Inc., has been organized at Houston, Texas, as a $250,000 corporation to take over the properties of the Gates Chemical Company of that city. White cement will be manufactured.

H. J. Harris is president and C. S. Atkinson is secretary-treasurer.

Virginia Price Lowered

The Lone Star Cement Company Virginia, Inc., at Norfolk, Virginia, a subsidiary of the International Cement Corporation, has announced a reduction in the base price of cement, effective since December.

Cement Consumption Increased in 1928

Now Nearly Equal to Production Rate — Industry's Position Bettered With Larger Units Anticipated and Efforts to Check Foreign Competition Under Way—A Review Taken from "The Economist"

MORE and more in the last few years have investors been attracted by possibilities of higher prices for cement stocks. Consumption in the field has increased from year to year, touching an all-time high in 1928, thanks to the greater diversification of uses evolved under the direction of the industry's mentor—the Portland Cement Association. So that, despite the present bane of over-expansion of plant capacity, and the increased domestic absorption of duty-free foreign-made cement, the statistical position of the industry in this country has been immeasurably improved.

The two chief handicaps encountered by the business in its spread toward the fullest possible dominance of the market in this country, are being treated as effectively as possible at present. Granted success in both ventures, there is every indication that the earnings' position of the leading producers with their strategically located plants, will be considerably bettered.

Meanwhile strong efforts are being made to interest the government in a tariff on imported cement that may provide some sort of protection. With the imposition of a duty on foreign cement, now duty free, the factor of cheap foreign labor would not offer obstacles to American producers.

Consolidations Ahead

Also, the over-expansion of plant capacity is expected to be taken in materially through the realignment of producing units, due to the necessity for a regulated production that will be more compatible in total annual output with total annual requirements. At present, restrictive output regulations have had a wholesome effect, reflected by the fact that in the last six or seven months consumption of cement in the United States has more nearly approximated production rates. This is shown by the reduction of stocks on hand of 13,130,000 barrels since last April, despite the production of 148,569,000 barrels in the first ten months of this year compared with an output of 145,495,000 barrels in the corresponding period of 1927.

The growth of consumption has been inevitable, as indicated. In 1910, cement output for the year totaled 76,549,951 barrels; in 1915, 85,914,907; in 1920, 100,023,245; in 1925, 161,658,901 barrels. This year, reliable estimates conservatively place the total output at 177,000,000 and the total consumption at 2,000,000 barrels less than this figure.

This improvement in the domestic absorption of the native output is due entirely to the growing requirements of public and private construction in this country.

Since 1876, when cement was really only beginning to draw attention to its possibilities for construction and when the output for the year was little over 100,000 barrels, the status of the product has been changed from that of a specialty to that of an important commodity—with a variety of uses. Today building construction and highways each account for about 25 per cent of the total annual consumption; farms and farming, about 20 per cent; dwellings 10 per cent; sidewalks, railways, irrigation projects, river and harbor work, dam and concrete piping another 20 per cent. The figures boxed in the table on this page, showing the increase of production and consumption of cement in the United States in the last 19 years, amplify this point.

To what extent the growth in highway construction alone has bolstered the volume of consumption is indicated by the fact that whereas fifteen years ago less than 2 per cent of the country's highways were constructed of cement, today 30 per cent is a conservative figure, with the growing traffic of automobiles and motor trucks for passengers and light freight pointing to a still further gain in this direction.

Cement Production. Shipments and Stocks
(In Barrels)

Year	Production	Shipments	Stocks on Hand at End of Year
1910	76,549.951	73,000,000	9.000.000
1911	78,528.637	75,547,829	10,385,789
1912	82.438.096	85,012,556	7.811,329
1913	92.097.131	88,689.377	11.220.328
1914	88.230,170	86,437,956	12,773,463
1915	85.914,907	86,891,681	11,462,523
1916	91.521,198	94,552,296	8,360,552
1917	92,814,202	90,703.474	10,353.838
1918	71.081,663	70,915.508	10.451.044
1919	80,777,935	85.612.899	5.256.900
1920	100.023.245	96,311,719	8,833,067
1921	98,842,049	95.507.147	12.192.567
1922	114,789.984	117,701,216	9,267,238
1923	137,460.238	135,912.118	10,900,370
1924	149,358,000	146,048,000	14,123,000
1925	161,658,901	157,295,212	18,336,173
1926	164,530,170	162,187,090	20,679,253
1927	173.206,513	171,864,728	22.081.972
1928	*177,000,000	*175,000,000	

*Estimated.

While these factors have been stimulating the domestic demand, competition along the Atlantic seaboard from European cement makers, especially from the Belgians, has been forcing price reductions in order to meet the competition.

Despite this situation one or two of the larger American producers of cement have shown the value of sound management in the face of an adverse competitive situation, prospering despite the price-cutting. International Cement Corporation is a notable instance. While with a protective tariff, the organization would earn from $3 to $4 more a share than it now does and would no doubt increase its dividend of $4, which was earned almost twice this year, an excellent showing has been made despite the competitive situation stressed.

Its net sales have increased yearly from $8,461,896 in 1920 to $23,671,139 in 1927. And for 1928, earnings a

HYDRAULIC CEMENT

	EXPORTS				IMPORTS			
	1927		1928		1927		1928	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	73,346	$254,072	56,400	$204,875	193,175	$269,661	234,753	$342,797
February	71,404	233,985	62,828	221,620	130,421	200,680	164,408	217,525
March	67,956	240,165	74,983	265,719	181,145	261,519	235,930	330,074
April	72,383	243,832	61,676	205,882	192,318	313,262	249,458	324,371
May	59,332	205,574	70,173	236,005	178,929	263,618	190,509	256,872
June	69,205	237,281	59,536	201,313	129,111	201,682	266,537	359,637
July	72,337	249,737	83,759	291,055	175,042	249,665	112,887	151,877
August	61,371	209,198	88,736	302,866	117,605	170,167	259,988	358,858
September	57,890	207,817	71,995	252,843	233,066	304,796	173,439	226,295
October	67,639	230,668	*	*	221,274	321,777	*	*
November	79,764	257,428	*	*	141,485	190,419	*	*
December	62,099	226,969	*	*	156,609	209,205	*	*
	816,726	2,796,717			2,050,180	2,956,451		

---

*Not yet available.

share of common stock are expected to be between $7.50 and $7.75 on the 618,826 shares of common now outstanding, compared with $6.90 a share earned in the year ended December 31, 1927, on 562,500 shares then issued.

The strategic location of International Cement's thirteen plants is a pronounced factor in the corporation's success. Because of the seasonal trend of the business in this country, most cement shipments are made in five warm weather months of the year. The southern and foreign plants of the corporation have stabilized their production and earnings, and notable benefits have accrued from Mississippi River flood control work. The following income record will illustrate the growth of the organization:

Year end. Dec. 31	Net Income	Earned a Sh. Com.	Surp. for Year
1927	$4,554,172	$6.90	$1,629,500
1926	4,355,199	6.52	1,542,675
1925	3,976,385	7.04	1,716,845
1924	3,047,507	7.14	1,377,230
1923	2,422,577	6.37	1,150,609
1922	1,425,047	4.07	467,398
1921	1,529,901	4.55	735,235
1920	1,779,559	6.64	1,444,433

It should be remembered that the dividend policy of this corporation has been extremely conservative, a large portion of the annual earnings being ploughed back into surplus. On the other hand, surplus earnings and funds provided by depreciation and depletion charges have not always been sufficient to meet the costs of expansion, so that on more than one occasion it was found expedient to offer stock subscription rights. Early this year a 10 per cent increase in common stock was subscribed at 65 and $18,000,000 of convertible 5 per cent bonds were sold. The proceeds went to redeem the entire $9,550,000 7 per cent preferred stock and to acquire the properties of the Phoenix Portland Cement Company with a plant at Nazareth, Pa., and the Warrior Portland Cement Corporation with a plant at Demopolis, Ala. The purchase of these plants brought the total of directly owned units to thirteen, increasing production 25 per cent and the total annual capacity from 16,200,000 to 20,000,000 barrels of cement.

The earning power of the International Cement Corporation has been strengthened considerably. In the first nine months of 1928 earnings showed $5.43 net per share compared with $4.94 in the 1927 period. The margin of profit from operations was maintained at 22 per cent on sales in the nine months of 1928 as against 23 per cent in the 1927 period.

Lehigh Net Off

Another leading producer of cement, the Lehigh Portland Cement Company, with a record of production totaling, on the average, 11½ per cent of the entire industry's output in the last five years, has twenty plants located in Pennsylvania, Indiana, Iowa, Kansas, Illinois, Washington, New York, Maryland, Virginia and Alabama. Gross sales in the five years 1923-27 inclusive have annually averaged $31,154,000—approximately the 1927 figure. The net income has shown a tendency to decline, however, the total of the year ended November 30, 1927 being $4,118,844, equal to $5.64 a share of common stock, compared with $5,243,887 or $8.14 a share in 1926; and a five-year average of $5,743,223 or $9.33 a share, based in each year on the present capitalization of 225,174 shares of preferred and 450,348 common stocks. Production has shown a constant increase, thus suggesting the decline in net as a consequence of the foreign competition and resulting reduced factory price of cement. Barrels of cement shipped annually increased from about 16,238,000 in 1922 to more than 18,000,000 in 1926 and 1927.

Another organization whose earnings may have been adversely affected in the last two fiscal years for which earnings statements are available, by the competitive situation, is the Alpha Portland Cement Company. Like other cement companies, it has encouraged the belief that a period of consolidations is imminent, and that important realignment of producing units are likely to be made, for the purpose of strengthening sagging market prices as well as reducing operating costs by its expansion program.

In May, 1928, Alpha Portland Cement acquired the Phoenix plant at Birmingham, Ala. The total annual production capacity is now estimated at 12,500,000 barrels. The following record for the last seven years will serve to complete a picture of an unevenly maintained earnings position of even principal producers in the field.

Year ended Dec. 31	Gross Sales	Net Income	Earned a Sh. Com.
1927	$19,226,270	$2,359,286	$3.74
1926	17,250,792	2,603,498	4.16
1925	20,128,921	3,858,246	18.58
1924	20,203,810	3,085,851	18.64
1923	20,629,502	3,028,399	18.28
1922	15,070,868	1,617,359	9.35
1921	10,717,546	672,338	3.37

Percentage of Production

The five principal producers in the cement making industry today, including International, Lehigh, Alpha, Universal and Atlas, whose combined total annual production is estimated, roughly, at 90,000,000 barrels of cement, is less than 40 per cent of the entire industry's total capacity, which is placed at around 230,000,000 barrels a year. With the smaller units eventually eliminated, as a result of the strengthening of leading producers through consolidations (and certain Eastern banking circles already are circulating predictions of a number of important mergers for 1929) it is easy to see a resulting unification of production that will be confined to immediate demand, until some definite action has been taken at Washington with respect to duty-free importation of foreign cement.

While foreign consumption of American-made cement has shown some satisfactory gains, they are hardly sufficient to offset the losses, in point of profits, incurred by the growth of imports of cement, as the table of figures on this page will indicate. It shows that while the value of cement imported in 1927 exceeded the value of exported American cement by less than $200,000, the total barrel imports by far exceeded the total number of barrels exported.

Investment Possibilities

So that the investor, to return to the beginning of the premise laid down in the course of this article, is justified at present in checking closely the investment possibilities of cement stocks on the strength of the healthy increase in consumption, rather than because of a material strengthening of the earning power of the industry in toto.

German and Belgian Cement Interests Seek Agreement on Dutch Market

Negotiations are under way between the cement producing firms of Belgium, Germany and Holland in regard to regulating sales in Holland. An agreement covering sales in Belgium and Germany has been in operation for quite some time but strenuous competition between the two countries for the control of the Dutch market has been detrimental not only to these two countries but also to the single cement producing plant which exists in Holland. This latter mill is able to produce only a small part of the 800,000 tons of cement used annually in Holland so the market is naturally a coveted one.

A definite pact between the German and Belgian cement industries regulates the market of those two countries but up to the present they have been unable to conclude a similar trade agreement covering sales in Holland.

Oregon Dividends Likely If 1929 Proves Good Year

Directors of the Oregon Portland Cement Company met on November 27th at Portland, Oregon. No definite action was taken with respect to the company's finances, but it seemed assured that if the company's business develops during the next year as anticipated, it will be possible to consider the matter of paying dividends on common stock.

Oregon Portland Cement has 71,515 shares of no-par common stock outstanding. Five shares of this stock were given as a bonus to holders of preferred stock of the Oregon Portland Cement Company and the Sun Portland Cement Company, when those companies were merged in September, 1925. This no-par common, at the time of the merger, was assigned a nominal value of $10 a share, and the stock has never brought much more than that on the unlisted market since the merger was effected. Recent sales have been made at around $12 a share. This merger was one of the sweetest financial "melons" ever cut in Oregon, owners of a $100 mortgage bond of the Oregon Portland's predecessor company, receiving stocks and cash dividends worth $583, on basis of book values and earning power. No dividends have ever been paid on the company's common, although earnings have always been ample to pay dividends on the company's 7 per cent cumulative sinking fund voting preferred and 7 per cent convertible preferred stock.

Directors of the company who met Tuesday last were L. C. Newlands, H. L. Knappenberger, Chester V. Dolph, Edward W. Cookingham and E. B. Ireland.

Analyze Superior Portland Cement Stock Prices

The local press comments on the current sale of Superior Portland Cement, Inc., stocks as an example of the tendency for various classes of stocks of the same corporation sometimes to sell out of line with each other.

On the basis of unofficial reports, earnings applicable to the "A" stock are expected to be approximately $6.50 a share for the current year. Provided it was entitled to sell at 10 times earnings, which is conservative, the "A" stock should bring about $65 a share in the present market, while the "B" stock, earning at the rate of $4.75, should bring around $47.50 on the same basis. A theoretical spread of $18 a share appears logical instead of the four-point difference indicated by recent sales of class "A" stock at 48 and "B" stock at 44.

Class "A" stock participated equally in earnings with class "B" after the former had received dividends of $3.30 a share and the latter $1.50 a share. Hence as long as both classes exist, the class "A" stock will yield $1.80 a year more than the junior issue and this added cash income should be reflected in market prices.

Projected California Plant Backed by Atlas

Reports published in CONCRETE from time to time regarding the drilling and surveying being carried on at Volcano, California, near Stockton, with a view to the location of a cement plant there, are followed by new reports crediting the Atlas Cement Company as the backer.

It is reported that Atlas holds options on 500 acres of land which if taken up are to be paid in cash during the present month. Right-of-way options for a railroad are also held. The proposed line would extend from the city of Sutter Creek to Volcano.

Drilling operations have now been completed, producing samples of an excellent grade.

International Stock Dividend Deemed Possible

Better control of costs is credited with having enabled the International Cement Corporation to increase its ratio of net income to gross sales. The ratio has advanced to 17½ per cent from 16.40 for 1928. A result in net profits of better than $7 a share for the year is forecast, compared with $6.90 in 1927, and announcement of a stock dividend is eminent.

MEN and MILLS

Notes from the Field

Home Town Thanks McCourtie for Civic Gifts

W. H. L. McCourtie, president of the Trinity and Northwestern States Portland Cement Companies is how he is generally known in the cement and other industries in which he is interested.

But it seems that he is "Herb" to the residents of his home town of Somerset Center, Michigan. He is also its only distinguished citizen. It was in his honor that a town-wide dinner—a welcome-home—was given on January 2nd at Somerset Center. The occasion was conceived to make it possible for the residents of the town's seventy-five houses to thank Mr. McCourtie for his civic generosity. No oratory, however, was permitted.

It seems that three years ago, upon returning to his home town for the first time in many years—years which had brought material success—Mr. McCourtie was taken aback by the change, more apparent to him because of his prolonged absence. The drabness and dinginess bespoke the need for paint. Thus he saw his opportunity to express his real affection for the town. He arranged with the local storekeeper to give paint to every family in the township. They were to have enough paint, of the color they wished, to paint their houses. That was three years ago. In the first year his paint bill was $3,145, and the next year $1,115, and in the last year, $1,500. Each of the 75 houses and barns in Somerset Center now boasts a coat of paint, thanks to "Herb" McCourtie.

Pleased to see how neatly his plan had worked out, he built a $500,000 park about the local stream and made his old home a community house in the center of the park. In addition, he had a water system installed and has made plans to rebuild the church.

It was to thank McCourtie for these things that the dinner was held in his honor.

John C. Eden Succumbs After Year's Fight Against Illness

John C. Eden, president of Superior Portland Cement, Incorporated, died at his home in the Highlands, near Seattle, on January 12th, after a series of sinking spells in past months.

Eden became ill during a world tour a year ago. Returning to the United States from Java, he spent several months at Baltimore under the care of Johns-Hopkins specialists. In October he was taken from his home for an operation. His condition steadily became worse and an operation was performed late in November.

Superior Portland was his chief business interest. In 1905, Mr. Eden, Jas. D. Hoge and others formed the Superior Portland Cement Company. On reorganization three years ago the company was capitalized at $6,000,000. He also organized the Bellingham coal mines.

Eden was born in Ontario, got his first job at eighteen as a telegrapher at Buffalo, N. Y., worked up in the railroad field, joined the Jas. J. Hill organization and arrived at Seattle early in this century as western traffic manager for the Great Northern Railway Company. He then left railroad work to engage in the cement business.

Florida Cement for Panama Canal Job

Tampa-made portland cement will be used in making improvements to the Panama canal and shipments to the canal will be the first foreign shipments to leave the Tampa mill.

A bid to supply 80,000 sacks of cement, submitted some time ago, was the lowest of all bids received at Washington, and officials of the plant were informed that the award had been made.

The first shipload of cement was to leave about January 1. Another will be sent to Panama March 1. G. W. Walker, an inspector chemist from the bureau of standards, arrived to take tests of the cement as it is manufactured. Plant officials say every sack of cement turned out by the Tampa mill has exceeded government specifications.—*Tampa Tribune.*

"Diamond Cement" Is New Name of Rock Carrier

The name of the Pacific Coast Steamship Company's lime rock carrier, Eastern Coast, was formally changed to Diamond Cement, the name of one of the products of the Pacific Coast Cement Company, Seattle's latest industry, recently. Permission to make the change was given by the shipping board to A. F. Marion, manager of the owning company. The Diamond Cement sailed on her first voyage under her new name recently for Dall Island, where she will lift lime rock.

Cowell Holds Annual Yule Party

The Cowell Portland Cement Company held its annual house party, Christmas tree and dance on December 22nd, at the Cowell hall, Walnut Creek, Calif. Gifts were presented to employes and their families.

Pacific Coast Cement Hits the Editorial Line

The following is a reprint from a Seattle daily paper and broadcasted by the Pacific Coast Cement Company by way of a leaflet.

The Pacific Coast Company, established in 1880, is now constructing a $3,000,000 cement plant in Seattle. The Northwest may have been young once, but a 50-year old company denotes age for any community.

Interesting, because after years of experience in operating coal mines, ships from Nome to San Diego, the first railroad into Seattle and many other activities, the company will expand to enter another industry where all its subsidiary companies can benefit.

Interesting, because the cement plant as a coal consumer burns coal equivalent to the domestic needs of one-third the homes in a city the size of Seattle. Nature put coal beneath Washington. The increased burning of pulverized coal in great industrial furnaces is keeping "fuel dollars" in Seattle.

Interesting, because cement makes concrete and concrete makes for permanence. Roads and building permits in the Northwest are gaining each year.

Interesting, because the limerock before being made into cement will be hauled by water. Distance makes little difference once a commodity is loaded on a ship. Exhaustive surveys by the company's engineers revealed that for a quality high in calcium carbonate the Alaskan limerock is not excelled in the world.

Each year Alaska means more to the Northwest. In 1867 when it was purchased for $7,200,000 it was called "Seward's ice-box." In January great buildings and long-wearing highways will be built with cement made from limerock that for centuries has been only inside the door of the United States' greatest mineral chest.

Grinding Out the Stuff

THE PLANT IS FINISHED RIGHT ON SCHEDULE
IT'S UP TO THE SALES DEPARTMENT NOW
DAR— THE CEMENT IS STARTING TO COME. WE GOTTA GET BUSY OR WE'LL BE SNOWED UNDER
PACIFIC COAST CEMENT CO.
YOU BET WYLIE— I CAN SEE ORDERS COMING IN NOW
DIAMOND CEMENT
1929 IS GOING TO BE A ~~HARD~~ YEAR
THERE WILL BE A LOT OF DIAMOND CEMENT USED

The Pacific Coast Cement Company used this illustration to announce the beginning of operation at its Seattle plant on December 26th

Lawrence Cement Men Form Foremen's Club

Department heads of the Lawrence Portland Cement Company recently formed a Foremen's Club at a dinner meeting held at the Allen House, Northampton, attended by forty-one employes of the plant with David Adams, safety engineer, presiding as chairman.

An address on "Harmony" given by Dr. Charles A. Haff impressed the men to such extent that they adopted the slogan "For Harmony" as the club's motto. M. S. Ackerman, superintendent of the plant, who with a number of the office force were guests, spoke briefly words of approval for the new organization.

It is the present intention of the club to meet monthly during the winter and in the future develop into a Foremen's Club that will include all industries of the borough.

A committee consisting of Messrs. Mummey, Ryan and Peters was appointed to work in conjunction with the chairman, Mr. Adams, and the secretary-treasurer, W. T. Kiechel, in the conduct of the business of the club.—*Allentown Call.*

Berns Chairman of C. A. C. Advertising Group

Max A. Berns, publicity manager of the Universal Portland Cement Company, was on January 10th elected chairman of the Advertising Council of the Chicago Association of Commerce. He succeeds Homer J. Buckley who has served as chairman for five years.

Mr. Berns is a member of the good roads committee and the street traffic committee of the Chicago Association of Commerce; was chairman last year of division 15—contractors and building material—of the association; and is a member of the committee on advertising and publications of the Portland Cement Association.

Lawrence Holds Safety Meeting

The employes of the Lawrence Portland Cement Company met recently in the social rooms of the cement company for their regular semi-annual safety meeting. The chairman of the meeting made a brief review of the company's accident experience for the past four years, which showed a remarkable reduction in the lost-time accidents and the number of days lost due to those accidents. After this report, the speaker of the evening, William C. Kutz, principal of the Northhampton Junior High school, was called upon. Mr. Kutz gave a splendid talk in which he made known the various activities in the local schools, both in the class rooms and in the safety patrols, by which the schools attempt to instill into the pupils safe practices which can be applied not only in the schools and homes but on the highways, in camps, and the respective industries with which they may affiliate themselves upon their maturity. Special emphasis was laid upon the fact that the local schools were co-operating to the fullest extent with the national safety council and the American Automobile Association, through the Lehigh Valley Motor Club, in carrying out their educational programs. Mr. Kutz also pledged hearty co-operation with the various drives inaugurated by the industries.

David Adams, who is the safety engineer of the Lawrence Portland Cement Company, made it possible to affiliate the local schools with the National Safety Council. Likewise the success attained by the Northampton plant of the Lawrence Portland was due to his untiring efforts and the response of the employes to the safety appeal made by Engineer Adams.

M. S. Ackerman, who is the superintendent of the Lawrence Portland, was called upon and commented upon the excellent address made by the representative of the Northampton schools, registering gratification in the completeness in which the safety program was being incorporated with the studies in the grades. After the program, a social hour followed at which time delicious refreshments were served.

Walter S. Wing New Penn-Dixie Sales Manager

Walter S. Wing, formerly with the Universal Portland Cement Company, has been appointed sales manager for the Pennsylvania-Dixie Cement Corporation. Mr. Wing will be located at the corporation's New York offices at 131 East 46th Street.

New International Cement Corporation Director

E. M. Allen, president of the Mathieson Alkali Works, Inc., has been elected a director of the International Cement Corporation.

Cement Statistics for December

Shipments 16 Per Cent Above December, 1927—Total Production for the Year 4,000,000 Greater Than for Last Year—Plants Operate at 60.4 Per Cent of Capacity During December and 74.0 for the Year

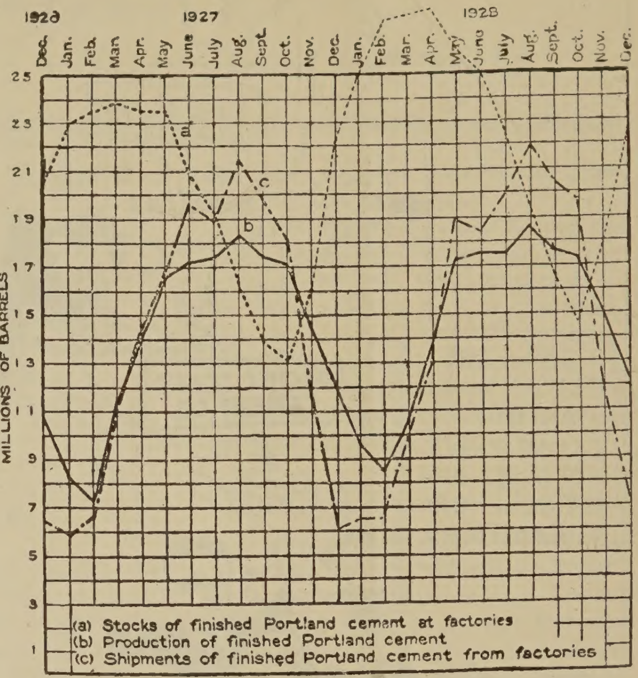
NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION APPEARS IN SLIGHTLY HEAVIER TYPE.

Relation of Production to Capacity

(Figures represent per cent)

	December 1928	December 1927	Nov. 1928	Oct. 1928	Sept. 1928
The month	60.4	**60.7**	77.4	87.1	91.7
The 12 months ended	**74.0**	73.9	74.1	73.8	73.7

	1927	1928	Increase Per cent
Production, Dec.	11,999,000	**12,189,000**	1.5
Shipments, Dec.	6,200,000	**7,384,000**	16.0
Stocks at end of Dec.	22,082,000	**22,573,000**	2.2
Total production for year	171,908,000	**175,968,000**	2.3
Total shipments for year	170,922,000	**175,455,000**	2.6
No. of plants reporting	155	**159**	2.5



Production, Shipments and Stocks of Finished Portland Cement, by Districts, 1927 and 1928, and Stocks in November, 1928

District	Production—December 1927	Production—December 1928	Shipments—December 1927	Shipments—December 1928	Stocks at end of month 1927	Stocks at end of month 1928	Stocks at end of November 1928*
Eastern Pa., N. J., and Md.	**2,941,000**	2,760,000	1,671,000	**1,963,000**	**5,107,000**	5,047,000	4,251,000
New York and Maine†	701,000	**812,000**	402,000	**495,000**	1,529,000	**1,656,000**	1,339,000
Ohio, Western Pa. and West Va.	970,000	**1,029,000**	**445,000**	606,000	2,607,000	**2,861,000**	2,439,000
Michigan	952,000	**1,058,000**	317,000	**416,000**	**2,205,000**	1,998,000	1,355,000
Wis., Ill., Ind., and Ky.	1,605,000	**1,683,000**	544,000	**644,000**	2,614,000	**2,668,000**	1,629,000
Va., Tenn., Ala., Ga., Fla., and La.	**1,162,000**	1,084,000	786,000	**870,000**	1,682,000	**1,896,000**	1,683,000
Eastern Mo., Ia., Minn. and S. Dak.	1,247,000	**1,269,000**	240,000	**359,000**	2,732,000	**2,882,000**	1,972,000
Western Mo., Nebr., Kansas, and Okla.	**713,000**	691,000	357,000	**507,000**	**1,620,000**	1,335,000	1,150,000
Texas	**514,000**	472,000	358,000	**375,000**	407,000	**522,000**	424,000
Colorado, Montana, and Utah	113,000	**206,000**	63,000	**68,000**	370,000	**535,000**	398,000
California	902,000	**909,000**	890,000	**914,000**	**809,000**	753,000	757,000
Oregon and Washington	179,000	**216,000**	127,000	**167,000**	400,000	**420,000**	372,000
	11,999,000	**12,189,000**	6,200,000	**7,384,000**	22,082,000	**22,573,000**	17,769,000

Production, Shipments and Stocks of Finished Portland Cement, by Months, in 1927 and 1928

Month	1927—Production	Production—1928	1927—Shipments	Shipments—1928	Stocks at end of month 1927	Stocks at end of month 1928
January	8,258,000	**9,768,000**	5,968,000	**6,541,000**	22,914,000	**25,116,000**
February	7,377,000	**8,797,000**	**6,731,000**	6,563,000	23,563,000	**27,349,000**
March	**11,450,000**	10,223,000	**11,100,000**	10,135,000	23,922,000	**27,445,000**
April	**14,048,000**	13,468,000	**14,350,000**	13,307,000	23,654,000	**27,627,000**
May	16,701,000	***17,308,000**	16,865,000	**18,986,000**	23,503,000	**25,984,000**
June	17,224,000	***17,497,000**	**19,761,000**	18,421,000	20,972,000	**25,029,000**
July	17,408,000	***17,474,000**	18,984,000	**19,901,000**	19,397,000	**22,580,000**
August	18,315,000	***18,759,000**	21,411,000	**21,970,000**	16,292,000	**19,374,000**
September	17,505,000	***17,884,000**	19,828,000	**20,460,000**	13,996,000	**16,799,000**
October	17,174,000	**17,533,000**	18,105,000	**19,836,000**	13,141,000	**14,579,000**
November	14,449,000	**15,068,000**	11,619,000	**11,951,000**	16,022,000	***17,769,000**
December	11,999,000	**12,189,000**	6,200,000	**7,384,000**	22,082,000	**22,573,000**
	171,908,000	**175,968,000**	170,922,000	**175,455,000**	....	....

---

*Revised. †Maine began producing in April, 1928, and shipping in May, 1928.

Mill Equipment

Under Voltage Devices Operate After Time Interval

To meet the demand for a device to protect against failure of voltage in power circuits after a suitable interval has elapsed, the General Electric Company has introduced two new equipments bearing the designations MG-2 and PF-2. These are especially designed to drip the breaker in the circuit only after a suitable time interval, and will not cause interruptions to service when momentary voltage dips occur.

The MG-2 device is designed to operate in conjunction with suitable motor-operated mechanisms, and is available for use on alternating-current circuits only. It has an electrically interlocked switch which is so connected that power cannot be turned on unless the protective unit is in operative condition.

This undervoltage device is especially adapted for motor and synchronous converter service where it is desired to have the oil circuit breaker open when voltage fails or drops below a certain per cent of normal voltage for an appreciable time.

Each device contains a motor, a helical spring and a gear train. In operation, the motor runs and keeps the spring compressed through the gear train. Upon drop of voltage, the spring reverses the motor and runs the gear train in the opposite direction. If the under voltage persists, the travel along the gear train is completed and the circuit is broken by means of a tripping device. The time interval between the initial voltage dip and the breaking of the circuit may be varied by means of adjustments to the gear travel.

The new PF-2 undervoltage device is of the solenoid and plunger type with an air bellows for time delay. The time can be varied from approximately one second to one minute. This device can be applied to certain types of oil circuit breaker operating levers.

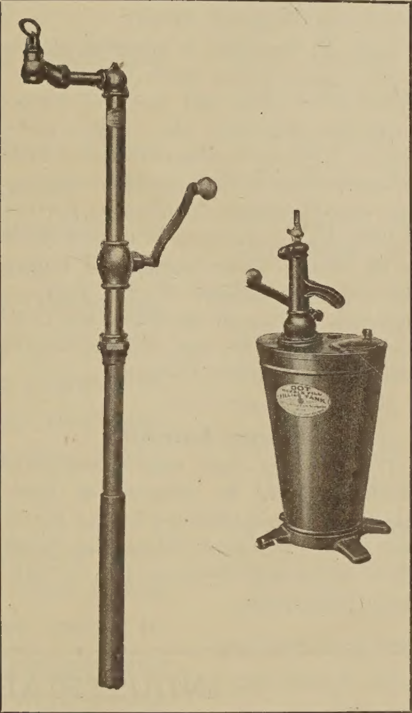
Suggest Pulleystone to Reduce Belt Slippage

Elimination of belt slippage and consequent increased machine production are claims made for a new material known as Pulleystone, whose purpose is to increase belt efficiency. It may be applied to the surface of iron, steel or wood pulleys.

It is sold on the basis of increasing the output of producing machines with existing equipment, according to the manufacturer. The material, in plastic form, is spread over the pulley with the hand and is then smoothed off with the back of the hand dipped in warm water. The surface is permanent, the Chicago Belting Company, Chicago, states.

Description of Dot Oiling System

The illustrations show what are the latest developments in Nozzle-Fil equipment, a product of the Dot Lubricating Equipment Company, division of the Carr Fastener Company, Cambridge, Mass.



Using the Dot long barrel pump, the greaser puts twenty-five pounds of lubricant into the Dot hand filling-tank. Carrying the Dot filling tank and the Nozzle-Fil hand gun, the greaser is ready. In filling the hand gun from the carrying tank the greaser loosens a lock-nut in order to release the plunger in the gun and engages its nozzles with the Dot nipple on the hand tank and pumps the gun full of grease.

In filling the Dot nipples or pressure cups on the bearings, he engages the nozzle of the gun with the nipple, twists the handle easily with one hand until the bearing flushes on the top of the cup reaches its extreme height.

New E C & M Shoe Type Brake for Bridge Drives

A new brake arranged for lever operation is being built by the Electric Controller & Mfg. Company of Cleveland, Ohio. This brake, known as the mechanically-operated, Type WB Brake, is of the shoe type and is intended for the bridge drives of electric traveling cranes, lift bridges, electric hoists and other applications requiring foot-operated or hand-lever-operated brakes.

A New Copes Pump Governor

Northern Equipment Company, Erie, Pa., announces a new pump governor, known as the Copes type DS governor.

This new Copes governor is designed for installation on simplex, duplex or triplex pumps, and on turbine or motor-driven centrifugal pumps. It is suited for differential excess pressure service for boiler feeding; constant pressure service; differential reducing valve service on motor-driven centrifugal pumps; relief valve service on belt- or gear-driven pumps.

The actuating element of the new governor is a two-ply brass sylphon bellows which has been subjected to tests of 93,000,000 reversals without failure. It is unaffected by high steam or water temperatures, it is also stated, and will withstand an unbalanced pressure of more than 400 lbs. The sliding stem valve common to most governors has been replaced by a horizontal lever shaft similar to the one used in the control valve of the Copes feed water regulator.

The new Copes type DS governor can be furnished in all sizes with straightway or angle bodies for 250, 400, 600, 900 and 1350 lbs. standard. It can be placed in either horizontal or vertical lines.

New Compensator Has High Interrupting Capacity

The CR-1034-K-33 is a new manual starting compensator announced by the General Electric Company, and said to have a high interrupting capacity. It is especially applicable to the control of high-speed, squirrel-cage motors including all two- and most four-pole motors, particularly those driving loads of relatively high inertia and therefore taking high inrush currents and requiring considerable time to get up to speed. For such applications the high capacity of the contact mechanism of this compensator should be of special value.

With the Manufacturers

NOTES FROM THE FIELD

Cutler-Hammer Changes Name

Announcement has been made of a change in the name of the *Cutler-Hammer Mfg. Co.*, Milwaukee, Wisconsin, manufacturers of electric motor control, wiring devices and allied lines. The new name of the company will be *Cutler-Hammer, Inc.*

The new company is organized as a Delaware corporation with the following officers: Chairman of the board, F. R. Bacon; president, B. L. Worden; vice-president, F. L. Pierce; vice-president, J. C. Wilson; treasurer, H. F. Vogt, and secretary, W. C. Stevens.

The board of directors is composed of: F. R. Bacon, Milwaukee, Wis.; F. L. Pierce, Milwaukee, Wis.; B. L. Worden, West Orange, N. J.; Carl A. Johnson, Madison, Wis.; T. Johnson Ward, New York, N. Y., and L. A. Lecher, Milwaukee, Wis.

In the change from a Wisconsin to a Delaware corporation, the Cutler-Hammer Mfg. Co., Milwaukee, the Cream City Foundry Co., Milwaukee, and Cutler-Hammer Mfg. Co., New York, are united under one name.

Brown Instrument New York Office

Since the end of December, the New York office of the *Brown Instrument Company* has been located at Room 1502, Roebling building, 117 Liberty Street, New York City, removing from 50 Church St.

This change was made necessary by the need of larger quarters to provide for the increased staff now attached to this district office.

Adamant Distributors

Botfield Refractories Co., Philadelphia, Pa., manufacturers of *Adamant Fire Brick Cement*, and other similar products, announce that the *Marshall Supply Company, Inc.*, operating in Pittsburg, Kansas, and Tulsa, Okla., have been appointed distributor of all their products.

Botfield Refractories Co. have also appointed *McCarthy-Jones & Allen Co., Inc.*, 111 First Avenue, South, Nashville, Tenn., distributor of all their products.

Enlarged Texrope Stock

On account of the demand for immediate shipment of transmission machinery, the *Allis-Chalmers Manufacturing Company*, Milwaukee, Wisconsin, have found it necessary to enlarge their stock of *Texrope* drives up to 50 hp. In 1927 an announcement was made that Texrope drives from 2 hp. up to 15 hp. were being carried in stock ready for immediate shipment. Since then this stock of Texrope drives has been increased to include all the popular motor speeds and ratings up to 50 hp. with a large choice of driven speeds in a range of ratios from 1:1 up to 7:1.

A catalog has been prepared to simplify selection of a suitable Texrope drive.

Copes System Representative

Northern Equipment Company, Erie, Pa., has appointed *Bradshaw & Company*, 530 Fourth Avenue, Pittsburgh, to represent the Copes system of boiler feed control in the Pittsburgh district.

Grant D. Bradshaw is president of this newly organized firm which is to specialize in power plant and steel mill equipment. Mr. Bradshaw was formerly president of Andrews-Bradshaw Company from its organization in 1915 until its consolidation with Blaw-Knox Company on January 1, 1928. During that time he devoted much of his time to Copes equipment. During 1928 he was manager of the Andrews-Bradshaw Division of the Blaw-Knox Company, resigning the first of this year to organize Bradshaw & Company.

Brown Exhibit

The following flush type power plant instruments will be mounted on black metal panels and exhibited by the *Brown Instrument Company* at the Chicago Power Show, to be held February 12th to 16th, at the Coliseum:

Indicating and recording pyrometers, indicating and recording flow meters, recording thermometers and pressure gauges, portable pyrometers and potentiometers, draft gauges, thermocouples, protecting tubes, automatic control valves and distant reading pressure transmitters, will be included in the exhibit.

Special interest will be found in the large 4-ft. flow meter, showing the mechanism and operation of the inductance bridge principle which will be demonstrated.

Review of Timken Expansion

The demand for the products of the *Timken Roller Bearing Company* has necessitated a radical expansion in its production facilities, an announcement states. The complete program that has been put into effect will provide the necessary equipment for raising the company's present output of 175,000 bearings per day to over 200,000 per day. The program has necessitated the expenditure of about $6,000,000 during the current year and covers additions to both the steel mill and bearing factory.

Steel producing facilities now in operation have increased the capacity of the plant to 30,000 tons per month of high grade open hearth and electric alloy steels.

Work has been started on various extensions to the bearing factory for the machine equipment needed to take care of the increase in the production schedule.

Manhattan Bonus

The Manhattan Rubber Manufacturing Company, of Passaic, N. J., announces the payment of a bonus to all of its employees. The bonus, amounting to 2 per cent of the employees' yearly salary, was distributed on December 20.

INDUSTRIAL LITERATURE

On Westinghouse Achievements

The Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., reviews its 1928 work in a special publication, No. 1717-C, and entitled *"Engineering Achievements."*

Synchronous motor drives in cement mills are described in one of the items, reference being made particularly to the installation in a western plant.

There are also descriptions of such electrical equipment as a large self-ventilated turbine generator, a record size and efficiency transformer, 30,000 KV-A synchronous condensers, and other industrial and non-industrial installations.

On Electrical Testing

The Wagner Electric Corporation, of St. Louis, Missouri, has just issued the fourth edition of its bulletin on *Manual of Electrical Testing*, a 20-page bulletin on testing single phase and polyphase motors, and testing transformers for core loss, copper loss, polarity, insulation, temperature rise and efficiency. This manual is known as Bulletin 138.